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PLANNING BOARD GRAFTON, MA

DRAINAGE REPORT

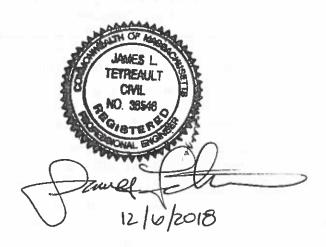
for



THE RIDINGS

Job #328-813 Client #1002

OCTOBER 9, 2018 REVISED DECEMBER 6, 2018



THOMPSON-LISTON ASSOCIATES, INC. CIVIL ENGINEERS & LAND SURVEYORS 51 Main Street, P.O. Box 570 Boylston, MA 01505 (508) 869-6151

Drainage Report

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The Ridings
Proposed flexible plan development of 39 lots at
88 Adams Road, Grafton, Massachusetts

December 6, 2018

Project Description

The project is the development of an 69.77 acre site in Grafton and also a similar size site in Westborough. There are 39 lots proposed in Grafton and another 19 in Westborough. Both developments will be "open space" subdivisions creating large open space parcels on their northerly sides which will be contiguous to existing protected land in Westborough. The site is shown as parcel 10 on assessor's map 32 in Grafton and is bounded westerly by homes along Adams Road, northerly by land of LaFlamme, easterly by the Town Line and southerly by the Massachusetts Turnpike. This report compares predevelopment and postdevelopment stormwater runoff in the Grafton portion of the site.

The applicant proposes to create Stidsen Road, named after a previous holder of the property, which will enter at the site's frontage on Adams Road in Grafton then proceed easterly into Westborough and connect to an extension of Harvest Way in that Town. Two culs de sac, Olive Circle and Randolph Circle, will be created on the northerly side of Stidsen Road in Grafton.

The existing cover of the site in Grafton is completely wooded with some existing trails on site. The soils on site are predominantly Paxton series soils categorized as hydrologic soil group "C" soils. There are also Chatfield Hollis series soils categorized as hydrologic soil group "B" soils at the southeast and westerly boundaries of the site. And there is an area in the southerly portion of the site labeled as "gravel pits" on the MassGIS soil maps. We are categorizing this area as hydrologic soil group "A" soils.

There is an intermittent stream and a wetland that flows from north to south through the site to a culvert at the Massachusetts Turnpike. The more easterly two thirds of the Grafton property slopes down to the west to this wetland. The westerly end of the site also flows down to this property.

Because these lots in Grafton are all to be served by septic systems, we have already had more than 80 deep observation holes officially observed by the Grafton Board of Health and this testing corroborated these characterizations of the soils present in different portions of the site.

Because some more than 6 acres of the site will have impervious cover and another 21 acres of the site will have its existing wooded cover changed to lawn or grass plot, there would be an increase in the peak rate of flow if measures were not taken to mitigate this change. To prevent this, we will create an infiltration basin beside Olive Circle and a detention basin off the end of Randolph Circle. We will create a large infiltration basin on the south side of Stidsen Road in the area labeled on the soil maps as having been gravel pits. Deep observation holes in this location showed soils to be loamy sand texture.

The effect of these two detention basins and the infiltration basin will be to keep the peak postdevelopment rates of flow to the culverts at the Massachusetts Turnpike below the rates of flow in the existing condition.

In addition, we propose to send roof runoff from 19 lots (numbers 1-7, 22-28, 31-34 and 37) to dry wells but we are <u>not</u> acknowledging that infiltration in these calculations to be conservative.

Methodology

In order to evaluate the existing and proposed hydrologic conditions of the site, we have employed the HydroCAD™ stormwater modeling software, which emulates the United States Department of Agriculture, Soil Conservation Service (SCS) hydrograph method as outlined in Technical Release 20 (1982). We have used the SCS modified soil cover complex method of evaluating cover conditions and underlying soil features in developing runoff curve numbers (RCN), and have determined Times of Concentration (ToC), using the methods described in the SCS's National Engineering Handbook, Section 4, Hydrology (1985). Each watershed with its Area, RCN and ToC, is described as a "Subcatchment" in HydroCAD™.

HydroCAD™ uses the Storage-Indication method for routing flows from "Subcatchment" areas through "Reaches" and "Ponds." Reaches are overland flow paths, pipe segments, or stream segments. Ponds are areas that collect water, such as basins, ponds or swales where outlet devices control outflow. Rainfall was determined from the Cornell University web site for this location and was determined to be 3.23, 4.87, 6.16, 7.36 and 8.79 inches in 24 hours for the 2, 10, 25, 50 and 100 year return frequency storms, respectively.

Design Points

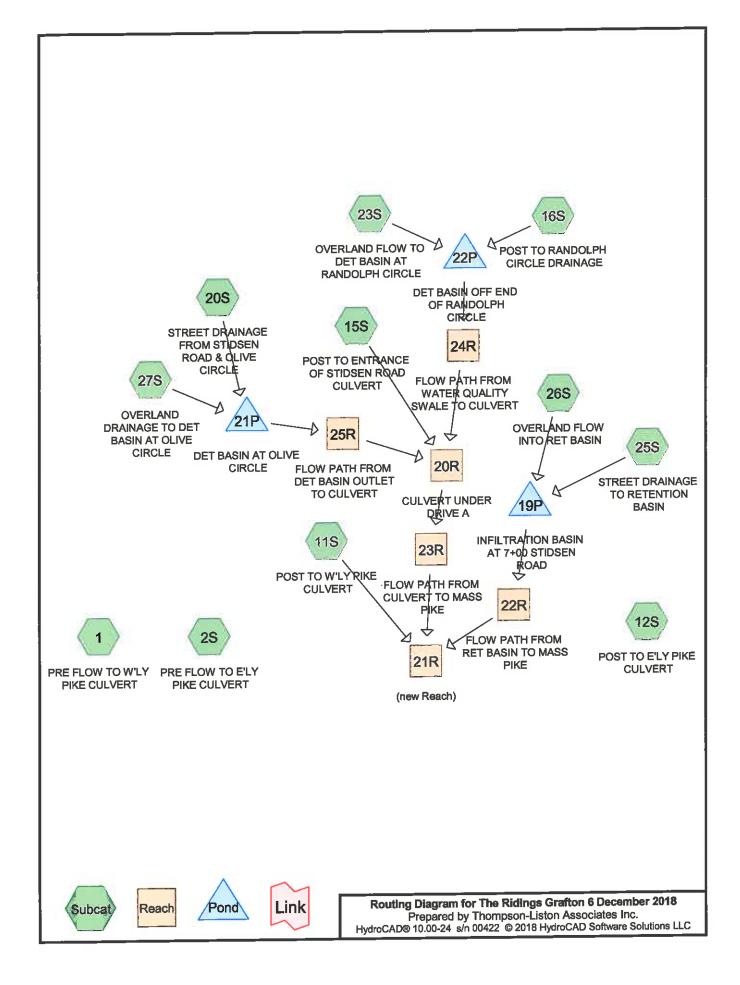
Two design points were studied. One is the flow to the more westerly of the two 60 inch culverts conveying flow under the Massachusetts Turnpike. This is where the great majority of runoff from this site goes. The second design point is the more easterly 60 inch culvert under the Massachusetts Turnpike.

Please note that analogous postdevelopment subcatchment areas have the same number as the predevelopment subcatchment for that area plus 10. Thus, the overland flow to the more westerly culvert under the Massachusetts Turnpike is subcatchment #1 in the predevelopment condition and subcatchment #11 in the postdevelopment condition.

Calculation Summary and Comparison of Flows:

The following table compares pre- and post-development flows at the Design Points (in cfs):

Pe	ak Rates of F	TABLE A low of Runof		vents	
Design Point	2-YR	10-YR	25-YR	50-yr	100-YR
W'ly culvert under I-90					
Subcatchment 1 pre	36.99	102.57	163.37	223.94	299.30
Reach 21 post	31.01	87.67	138.13	193.10	282.20
E'ly culvert under I-90					
Subcatchment 2 pre	1.84	5.37	8.67	11.96	16.07
Subcatchment 12 post	1.80	5.26	8.49	11.72	15.74



2 YEAR STORM

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Summary for Subcatchment 1: PRE FLOW TO W'LY PIKE CULVERT

Runoff

36.99 cfs @ 12.43 hrs, Volume=

5.132 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 2 YEAR Rainfall=3.23"

	A	rea (sf)	CN D	escription		
_	2	52,232			od, HSG A	
		30,414			od, HSG B	
	3,4	64 <u>,785 </u>			od, HSG C	
	3,8	47,431		Veighted A		
	3,8	47,431	1	00.00% Pe	ervious Area	a
	Tc	Length	Slope	Velocity (ft/sec)	Capacity (cfs)	Description
_	(min)	(feet)	(ft/ft)		(013)	Sheet Flow,
	9.5	50	0.0400	0.09		Woods: Light underbrush n= 0.400 P2= 3.10"
	10.0	1,077	0.1300	1.80		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	6.3	2,115	0.0310	5.58	111.63	Channel Flow, Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
_	25.0	2 242	Total			

25.8 3,242 Total

Summary for Subcatchment 2S: PRE FLOW TO E'LY PIKE CULVERT

Runoff =

1.84 cfs @ 12.22 hrs, Volume=

0.206 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 2 YEAR Rainfall=3.23"

	Ar	ea (sf)	CN E	Description		
		39,886		Voods, Go	od, HSG B od, HSG C	
	1	<u>24,226</u> 64,112 64,112	66 Weighted Aver 100.00% Pervi		verage	
(n	Tc nin)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	7.2		0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
	5.9	527	0.0900	1.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.4	207	0.0250	7.96	190.95	Channel Flow, Area= 24.0 sf Perim= 18.6' r= 1.29'
		704	Total			n= 0.035 Earth, dense weeds

13.5 784 Total

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Summary for Subcatchment 11S: POST TO W'LY PIKE CULVERT

Runoff

0.84 cfs @ 12.44 hrs, Volume=

0.179 af, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 2 YEAR Rainfall=3.23"

	Α	rea (sf)	CN	Description							
*		1,260	98	Impervious	mpervious A soils						
*		1,260	98	Impervious	B soils						
*		12,600	98	Impervious	C soils						
	1	08,430	30	Woods, Go	od, HSG A						
		5,012	55	Woods, Go	/oods, Good, HSG B						
		70,431	70	Woods, Go	oods, Good, HSG C						
		57,257			5% Grass cover, Good, HSG A						
		6,593			5% Grass cover, Good, HSG B						
		99,683	74	75% Grass cover, Good, HSG C							
	3	62,526	55	55 Weighted Average							
	3	47,406		95.83% Per	rvious Area						
		15,120		4.17% lmpe	ervious Are	a					
	Tc	Length	Slope	Velocity	Capacity	Description					
(r	ni <u>n)</u>	(feet)	(ft/ <u>ft</u>)	(ft/sec)	(cfs)						
	9.5	50	0.0400	0.09		Sheet Flow,					
						Woods: Light underbrush n= 0.400 P2= 3.10"					
	3.9	992	0.0800	4.24		Shallow Concentrated Flow,					
						Grassed Waterway Kv= 15.0 fps					
1	13.4	1,042	Total	· · · · · ·							

Summary for Subcatchment 12S: POST TO E'LY PIKE CULVERT

Runoff

1.80 cfs @ 12.22 hrs, Volume=

0.202 af, Depth> 0.66"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
111,978	70	Woods, Good, HSG C
8,865	74	>75% Grass cover, Good, HSG C
160,729 160,729	66	Weighted Average 100.00% Pervious Area

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	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
_	7.2	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
	5.9	527	0.0900	1.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.4	207	0.0250	7.96	190.95	Channel Flow, Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
_	13.5	784	Total			

Summary for Subcatchment 15S: POST TO ENTRANCE OF STIDSEN ROAD CULVERT

Runoff = 26.62 cfs @ 12.38 hrs, Volume=

3.392 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 2 YEAR Rainfall=3.23"

Α	rea (sf)	CN E	<u>Description</u>		
	25,208			ing & roofs	
	15,609	30 V	Voods, Go	od, HSG A	
	57,023			od, HSG B	
1,8	26,893			od, HSG C	
	1,620				ood, HSG A
	7,767	61 >	75% Gras	s cover, Go	ood, HSG B
1	77,1 <u>08</u>	<u>74 </u>	75% Gras	s cover, Go	ood, HSG C
2,1	11,228		Veighted A		
2,0	86,020			vious Area	
	25,208	1	.19% Imp∈	ervious Are	a
				0	Description
Tc	Length	Slope	Velocity	Capacity	Description
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	<u>(cfs)</u>	
9.5	50	0.0400	0.09		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		Shallow Concentrated Flow,
				445.44	Woodland Kv= 5.0 fps
4.8	1,638	0.0320	5.67	113.41	Channel Flow,
					Area= 20.0 sf Perim= 31.0' r= 0.65'
					n= 0.035 Earth, dense weeds
24.3	2 765	Total			

24.3 2,765 Total

Summary for Subcatchment 16S: POST TO RANDOLPH CIRCLE DRAINAGE

Runoff = 7.23 cfs @ 12.36 hrs, Volume=

0.852 af, Depth> 1.29"

1,363 Total

24.8

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11,0.00									
Aı	rea (sf)		escription	escription					
	66,896	98 P	Paved parking & roofs						
	66,352	70 V	Woods, Good, HSG C						
212,436 74 >75% Grass cover, Good, HSG C					ood, HSG C				
3	45,684	78 Weighted Average							
	78,788			vious Area					
	66,896	1	9.35% Imp	ervious Ar	ea				
	,								
Tc	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)					
10.7	50	0.0300	0.08		Sheet Flow,				
10.11					Woods: Light underbrush n= 0.400 P2= 3.10"				
14.1	1,313	0.0970	1.56		Shallow Concentrated Flow,				
,	.,				Woodland Kv= 5.0 fps				

Summary for Subcatchment 20S: STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE

2.85 cfs @ 12.17 hrs, Volume= 0.248 af, Depth> 1.63" Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 2 YEAR Rainfall=3.23"

	Α	rea (sf) _	CN	Description						
*		10,247	98	Impervious B soils						
*		24,274	98	Impervious	C soils					
		6,013	70	Woods, Go	od, HSG C					
		6,329	61	>75% Gras	s cover, Go	ood, HSG B				
		32,602	74	>75% Grass cover, Good, HSG C						
		79,465	83	Weighted A	verage					
		44,944		56.56% Per						
		34,521		43.44% lmp	ervious Ar	ea				
					0	Description				
	Tc	-	Slope		Capacity	Description				
1	(min)	(feet)	(ft/ft		<u>(cfs)</u>					
	11.0	50	0.0100	0.08		Sheet Flow,				
						Grass: Dense n= 0.240 P2= 3.10"				
	1.0	122	0.0100	2.03		Shallow Concentrated Flow,				
						Paved Kv= 20.3 fps				
	12.0	172	Total							

Summary for Subcatchment 23S: OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE

6.75 cfs @ 12.33 hrs, Volume= Runoff

0.810 af, Depth> 0.84"

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HYGIOCAD® 10.0	0-2-7 3/11	70 IZZ <u>0 Z</u>		
Area (sf)	CN	Description		
2,512	98	Paved park	ing & roofs	
19,818	74	>75% Gras	s cover, Go	ood, HSG C
481,569	70	Woods, Go	od, HSG C	
503,899		Weighted A		
501,387		99.50% Per		
2,512		0.50% lmpe	ervious Area	a
Tc Length			Capacity (cfs)	Description
10.7 50				Sheet Flow,
10.1 1,08				Woods: Light underbrush n= 0.400 P2= 3.10" Shallow Concentrated Flow, Woodland Kv= 5.0 fps
20.8 1,13	Total			

Summary for Subcatchment 25S: STREET DRAINAGE TO RETENTION BASIN

11.43 cfs @ 12.18 hrs, Volume= 1.029 af, Depth> 1.36" Runoff

	Ar	ea (sf)	CN D	escription				
*		14,440	98 lr	npervious	in A soils			
*		2,086	98 Ir	npervious	in B soils			
*	1	07,932	98 lr	npervious	in C soils			
		19,587	70 V	Voods, Go	od, HSG C	1 1100 A		
		17,729	39 >	75% Gras	s cover, Go	ood, HSG A		
		14,430 61 >75% Grass cover, God				00d, HSG B		
	220,338 74 >75% Grass cover, Goo					000, HSG C		
	3	396,542 79 Weighted Average						
	272,084			68.61% Pervious Area				
	1	24,458	3	31.39% Impervious Area				
	т.	Length	Slope	Velocity	Capacity	Description		
	Tc (min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
_	7.2	50	0.0800	0.12		Sheet Flow,		
	1.2	50	0.0000	0		Woods: Light underbrush n= 0.400 P2= 3.10"		
	4.6	438	0.1000	1.58		Shallow Concentrated Flow,		
	4.0	700	0			Woodland Kv= 5.0 fps		
	0.6	158	0.0440	4.26		Shallow Concentrated Flow,		
	0.0					Paved Ky= 20.3 fps		
_	12.4	646	Total					

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Summary for Subcatchment 26S: OVERLAND FLOW INTO RET BASIN

Runoff

0.00 cfs @ 23.95 hrs, Volume=

0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 2 YEAR Rainfall=3.23"

	Α	rea (sf)	CN D	escription		
_		36,895	39 >	75% Gras	s cover, Go	ood, HSG A
_		36,895	1	00.00% Pe	ervious Are	a
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	3.0		0.1860	0.24		Sheet Flow,
	0.1		0.3300	8.62		Grass: Dense n= 0.240 P2= 3.10" Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
-	3.1	69	Total			

Summary for Subcatchment 27S: OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE

Runoff

0.24 cfs @ 12.09 hrs, Volume=

0.020 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 2 YEAR Rainfall=3.23"

	Α	rea (sf)	CN [Description					
*		2,085	98 l	98 Impervious - wet bottom					
		1,108				ood, HSG C			
		11,382 _	61 >	75% Gras	s cover, Go	ood, HSG B			
	_	14,575		Veighted A					
		12,490			vious Area				
		2,085	1	4.31% lmp	pervious Ar	ea			
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description			
_	4.8	50	0.0800	0.17		Sheet Flow,			
	0.1	24	0.0330	2.72		Grass: Dense n= 0.240 P2= 3.10" Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps			
_	4.9	74	Total			4			

Summary for Reach 20R: CULVERT UNDER DRIVE A

Inflow Area =

70.130 ac, 4.30% Impervious, Inflow Depth > 0.88" for 2 YEAR event

Inflow

30.37 cfs @ 12.41 hrs, Volume=

5.132 af

30.35 cfs @ 12.42 hrs, Volume= Outflow

5.131 af, Atten= 0%, Lag= 0.2 min

Type III 24-hr 2 YEAR Rainfall=3.23"

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Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Max. Velocity= 6.66 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.72 fps, Avg. Travel Time= 0.3 min

Peak Storage= 246 cf @ 12.41 hrs Average Depth at Peak Storage= 0.46' Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 302.29 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished Length= 54.0' Slope= 0.0093'' Inlet Invert= 429.00', Outlet Invert= 428.50'

Summary for Reach 21R: (new Reach)

Inflow Area = 88.403 ac, 7.03% Impervious, Inflow Depth > 0.72" for 2 YEAR event

Inflow = 31.01 cfs @ 12.46 hrs, Volume= 5.310 af

Outflow = 31.01 cfs @ 12.46 hrs, Volume= 5.310 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: FLOW PATH FROM RET BASIN TO MASS PIKE

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth = 0.01" for 2 YEAR event

Inflow = 0.05 cfs @ 14.56 hrs, Volume= 0.009 af

Outflow = 0.05 cfs @ 14.59 hrs, Volume= 0.009 af, Atten= 0%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Max. Velocity= 0.94 fps, Min. Travel Time= 1.1 min

Avg. Velocity = 0.86 fps, Avg. Travel Time= 1.2 min

Peak Storage= 3 cf @ 14.57 hrs Average Depth at Peak Storage= 0.02' Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 292.23 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 5.0 '/' Top Width= 22.00' Length= 60.0' Slope= 0.0750 '/' Inlet Invert= 420.50', Outlet Invert= 416.00'

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Summary for Reach 23R: FLOW PATH FROM CULVERT TO MASS PIKE

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 0.88" for 2 YEAR event

Inflow = 30.35 cfs @ 12.42 hrs, Volume= 5.131 af

Outflow = 30.17 cfs @ 12.46 hrs, Volume= 5.122 af, Atten= 1%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.77 fps, Min. Travel Time= 1.5 min Avg. Velocity = 2.48 fps, Avg. Travel Time= 2.8 min

Peak Storage= 2,680 cf @ 12.44 hrs Average Depth at Peak Storage= 0.94'

Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 179.73 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 5.0 '/' Top Width= 22.00'

Length= 423.0' Slope= 0.0284 '/'

Inlet Invert= 428.50', Outlet Invert= 416.50'



Summary for Reach 24R: FLOW PATH FROM WATER QUALITY SWALE TO CULVERT

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 1.02" for 2 YEAR event

Inflow = 9.67 cfs @ 12.61 hrs, Volume= 1.657 af

Outflow = 9.24 cfs @ 12.80 hrs, Volume= 1.644 af, Atten= 4%, Lag= 11.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.50 fps, Min. Travel Time= 6.2 min Avg. Velocity = 1.62 fps, Avg. Travel Time= 13.5 min

Peak Storage= 3,459 cf @ 12.70 hrs Average Depth at Peak Storage= 0.48' Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 152.36 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 3.0 '/' Top Width= 16.00' Length= 1,309.0' Slope= 0.0252 '/' Inlet Invert= 462.00', Outlet Invert= 429.00'

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Summary for Reach 25R: FLOW PATH FROM DET BASIN OUTLET TO CULVERT

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth = 0.54" for 2 YEAR event

Inflow = 0.66 cfs @ 12.62 hrs, Volume= 0.096 af

Outflow = 0.65 cfs @ 12.67 hrs, Volume= 0.096 af, Atten= 0%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.95 fps, Min. Travel Time= 1.7 min Avg. Velocity = 0.51 fps, Avg. Travel Time= 3.1 min

Peak Storage= 65 cf @ 12.64 hrs Average Depth at Peak Storage= 0.10' Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 56.23 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 10.0 '/' Top Width= 26.00' Length= 95.0' Slope= 0.0132 '/' Inlet Invert= 430.25', Outlet Invert= 429.00'



Summary for Pond 19P: INFILTRATION BASIN AT 7+00 STIDSEN ROAD

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 1.24" for 2 YEAR event

Inflow = 11.43 cfs @ 12.18 hrs, Volume= 1.029 af

Outflow = 0.92 cfs @ 14.56 hrs, Volume= 0.798 af, Atten= 92%, Lag= 142.7 min

Discarded = 0.88 cfs @ 14.56 hrs, Volume= 0.789 af Primary = 0.05 cfs @ 14.56 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 426.11' @ 14.56 hrs Surf.Area= 15,686 sf Storage= 23,112 cf

Plug-Flow detention time= 285.6 min calculated for 0.796 af (77% of inflow) Center-of-Mass det. time= 201.4 min (1,051.3 - 849.9)

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Volume	Invert	Avail.Stor	age Storage	e Description	
#1	423.00		0 of Custor	n Stage Data (Pri	smatic) Listed below (Recalc)
Elevation (fee 423.0 424.0 426.0 428.0 430.0 430.0	on S st) 00 00 00 00	urf.Area (sq-ft) 0 3,900 15,500 18,800 22,400 25,500	Inc.Store (cubic-feet) 0 1,950 19,400 34,300 41,200 14,370	Cum.Store (cubic-feet) 0 1,950 21,350 55,650 96,850 111,220	
Device #1 #2 #3	Routing Discarded Primary Primary	1nvert 423.00' 426.00' 429.00'	8.0" Round Inlet / Outlet n= 0.013 Co 18.0' long x Head (feet)	Exfiltration over \$ Culvert L= 53.0 Invert= 426.00' / 6 prrugated PE, smo a 10.0' breadth Br 0.20 0.40 0.60	

Discarded OutFlow Max=0.88 cfs @ 14.56 hrs HW=426.11' (Free Discharge) —1=Exfiltration (Exfiltration Controls 0.88 cfs)

Primary OutFlow Max=0.04 cfs @ 14.56 hrs HW=426.11' (Free Discharge)

2=Culvert (Inlet Controls 0.04 cfs @ 1.14 fps)

3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 21P: DET BASIN AT OLIVE CIRCLE

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 433.23' @ 12.62 hrs Surf.Area= 3,297 sf Storage= 4,362 cf

Plug-Flow detention time= 140.9 min calculated for 0.248 af (93% of inflow) Center-of-Mass det. time= 103.6 min (943.8 - 840.2)

Volume	Invert _	Avail.Storage	Storage Description
#1	431.00'	34,416 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

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Elevation	Surf.Area	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
(feet)	<u>(sq-ft)</u>	(cubic-leet)	(Cubic-Icci)
431.00	0	0	0
432.00	2,090	1,045	1,045
434.00	4,050	6,140	7,185
436.00	6,275	10,325	17,510
438.00	8,710	14,985	32,495
	,	1,921	34,416
438.20	10,500	1,921	5-7,-10

Device	Routing		Outlet Devices	
	Primary	432.50'	6.0" Vert. Orifice/Grate	C = 0.600
	Discarded	431.00'	2.410 in/hr Exfiltration o	ver Surface area

Discarded OutFlow Max=0.18 cfs @ 12.62 hrs HW=433.23' (Free Discharge) —2=Exfiltration (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.66 cfs @ 12.62 hrs HW=433.23' (Free Discharge) 1=Orifice/Grate (Orifice Controls 0.66 cfs @ 3.34 fps)

Summary for Pond 22P: DET BASIN OFF END OF RANDOLPH CIRCLE

19.504 ac, 8.17% Impervious, Inflow Depth > 1.02" for 2 YEAR event Inflow Area =

1.662 af 13.94 cfs @ 12.35 hrs, Volume= Inflow =

1.657 af, Atten= 31%, Lag= 15.9 min 9.67 cfs @ 12.61 hrs, Volume= = Outflow

9.67 cfs @ 12.61 hrs, Volume= 1.657 af Primary

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 481.57' @ 12.61 hrs Surf.Area= 7,757 sf Storage= 13,037 cf

Plug-Flow detention time= 20.1 min calculated for 1.653 af (99% of inflow) Center-of-Mass det. time= 18.2 min (892.0 - 873.8)

Volume_ #1	Inve 479.0		rage Storage 40 cf Custom	Description Stage Data (Pri	ismatic) Listed below (Recalc)
Elevatio		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
479.0 480.0 482.0 484.0 485.4	0 0 0 0	5,400 8,400 11,500 13,700	0 2,700 13,800 19,900 17,640	2,700 16,500 36,400 54,040	
Device	Routing	Invert	Outlet Device		
#1 #2	Primary Primary	479.00' 483.00'	10.0' long x ' Head (feet) 0 Coef. (English).20	road-Crested Rectangular Weir 0.80 1.00 1.20 1.40 1.60 70 2.67 2.66 2.67 2.66 2.64
#3	Primary	481.00'	15.0" Vert. O	rifice/Grate X 3.	00 C= 0.600

Type III 24-hr 2 YEAR Rainfall=3.23"

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Primary OutFlow Max=9.63 cfs @ 12.61 hrs HW=481.57' (Free Discharge)

1=Orifice/Grate (Orifice Controls 5.44 cfs @ 6.93 fps)

2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-3=Orifice/Grate (Orifice Controls 4.19 cfs @ 2.57 fps)

10 YEAR STORM

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Summary for Subcatchment 1: PRE FLOW TO W'LY PIKE CULVERT

102.57 cfs @ 12.39 hrs, Volume= 12.528 af, Depth> 1.70" Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 10 YEAR Rainfall=4.87"

	Aı	rea (sf)	CN D	escription		
_	2	52,232			od, HSG A	
		30,414			od, HSG B	
_	3,4	64,78 <u>5</u>			od, HSG C	
	3,8	47,431	67 V	Veighted A	verage	
	3,8	47,431	1	00.00% P€	ervious Are	a
	Tc	Length	Slope	Velocity (ft/sec)	Capacity (cfs)	Description
_	(min)	(feet)	(ft/ft)		(013)	Sheet Flour
	9.5	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
	10.0	1,077	0.1300	1.80		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	6.3	2,115	0.0310	5.58	111.63	
_	25.8	3,242	Total			

Summary for Subcatchment 2S: PRE FLOW TO E'LY PIKE CULVERT

5.37 cfs @ 12.20 hrs, Volume= Runoff

0.513 af, Depth> 1.63"

Α	rea (sf)	CN D	escription		
	39,886			od, HSG B	
1	24,226	70 V	Voods, Go	od, HSG C	
1	64,112		Veighted A		
1	64,112	1	00.00% Pe	ervious Area	a
Тс	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)_	(cfs)_	
7.2	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	Channel Flow, Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
40.5	704	Total			

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Summary for Subcatchment 11S: POST TO W'LY PIKE CULVERT

Runoff

5.38 cfs @ 12.23 hrs, Volume=

0.633 af, Depth> 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 10 YEAR Rainfall=4.87"

	Aı	ea_(sf)		Description					
*		1,260	98	mpervious A soils					
*		1,260	98 I	mpervious	B soils				
*		12,600		mpervious					
		08,430	30 \	Voods, Go	od, HSG A				
		5,012	55 \	Voods, Go	od, HSG B				
		70,431	70 \	Noods, Go	od, HSG C				
		57,257	39 >	75% Gras	s cover, Go	ood, HSG A			
		6,593	61 >	75% Gras	s cover, Go	ood, HSG B			
99,683 74 >75% Grass cover, Good, HSG C						ood, HSG C			
	362,526 55			5 Weighted Average					
	347,406 15,120			95.83% Pervious Area					
			4	1.17% Impe	ervious Are	а			
	Tc	Length	Slope	Velocity	Capacity	Description			
	(min)	(feet)	(ft/ft)		(cfs)_				
_	9.5	50	0.0400			Sheet Flow,			
	9.0		5,0 .00	2.32		Woods: Light underbrush n= 0.400 P2= 3.10"			
	3.9	992	0.0800	4.24		Shallow Concentrated Flow,			
	3.5	332	0.0000			Grassed Waterway Kv= 15.0 fps			
_	12.4	1,042	Total						
	13.4	1,042	lotai						

Summary for Subcatchment 12S: POST TO E'LY PIKE CULVERT

Runoff = 5.26 cfs @ 12.20 hrs, Volume=

0.503 af, Depth> 1.63"

Area (sf)	CN	Description
39,886 111,978 8,865	55 70 74	Woods, Good, HSG B Woods, Good, HSG C >75% Grass cover, Good, HSG C
160,729 160,729	66	Weighted Average 100.00% Pervious Area

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			_			
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
_	7.2	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
	5.9	527	0.0900	1.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.4	207	0.0250	7.96	190.95	Channel Flow, Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
-	13.5	784	Total			

13.5

Summary for Subcatchment 15S: POST TO ENTRANCE OF STIDSEN ROAD CULVERT

66.68 cfs @ 12.36 hrs, Volume= Runoff

7.793 af, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 10 YEAR Rainfall=4.87"

Ar	ea (sf)	CN D	escription						
	25,208		Paved parking & roofs						
	15,609	30 V	loods, God	od, HSG A					
	57,023	55 V	loods, God	od, HSG B					
	26,893	70 V	loods, Go	od, HSG C					
.,.	1,620	39 >	75% Grass	s cover, Go	od, HSG A				
	7,767	61 >	75% Grass	s cover, Go	od, HSG B				
_1	77,108				od, HSG C				
2,1	11,228	70 V	Veighted A	verage					
2,0	86,020	9	8.81% Per	vious Area					
•	25,208	1	.19% Impe	ervious Area	9				
To	Length	Slope	Velocity	Capacity	Description				
Tc (min)	(feet)	(ft/ft)	(ft/sec)	(cfs)					
9.5	50	0.0400	0.09		Sheet Flow,				
9.5	50	0.0-100	0.00		Woods: Light underbrush n= 0.400 P2= 3.10"				
10.0	1,077	0.1300	1.80		Shallow Concentrated Flow,				
10.0	1,011	•			Woodland Kv= 5.0 fps				
4.8	1,638	0.0320	5.67	113.41	Channel Flow,				
1.0	.,				Area= 20.0 sf Perim= 31.0' r= 0.65'				
					n= 0.035 Earth, dense weeds				
24.3	2,765	Total	_						

Summary for Subcatchment 16S: POST TO RANDOLPH CIRCLE DRAINAGE

14.85 cfs @ 12.35 hrs, Volume= Runoff

1.712 af, Depth> 2.59"

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<u>HydroCAI</u>	D® 10.00-	24 s/n uu	142 <u>2 @ 20</u>	IO HYUIOCA	D Software Colditorio ELS		
Aı	rea (sf)	CN Description					
	66,896			ing & roofs			
	66,352	70 V	Voods, Go	od, HSG C			
	12,436	74 >	75% Gras	s cover, Go	ood, HSG C		
3	45.684		Veighted A				
2	78,788			vious Area			
	66,896	1	9.35% lmp	pervious Ar	ea		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description		
10.7	50	0.0300	0.08		Sheet Flow,		
14.1	1,313	0.0970	1.56	_	Woods: Light underbrush n= 0.400 P2= 3.10" Shallow Concentrated Flow, Woodland Kv= 5.0 fps		
24.8	1,363	Total					

Summary for Subcatchment 20S: STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE

5.32 cfs @ 12.17 hrs, Volume= 0.464 af, Depth> 3.05" Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 10 YEAR Rainfall=4.87"

	A	rea (sf)	CN [Description		
*		10.247	98 I	mpervious	B soils	
*		24,274	98 I	mpervious	C soils	
		6,013	70 \	Voods, Go	od, HSG C	
		6,329	61	75% Gras	s cover, Go	ood, HSG B
		32,602	74 :	75% Gras	s cover, Go	ood, HSG C
		79,465	83 \	Veighted A	verage	
		44,944		6.56% Per		
		34,521	4	13.44% lmp	ervious Ar	ea
						To the co
	Tc	Length	Slope		Capacity	Description
(min)	(feet)	(ft/ft)	<u>(ft/sec)</u>	(cfs)	
	11.0	50	0.0100	0.08		Sheet Flow,
						Grass: Dense n= 0.240 P2= 3.10"
	1.0	122	0.0100	2.03		Shallow Concentrated Flow,
						Paved Kv= 20.3 fps
	12.0	172	Total			

Summary for Subcatchment 23S: OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE

16.97 cfs @ 12.30 hrs, Volume= 1.862 af, Depth> 1.93" Runoff

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Hydrock	10.00-	<u> 24 3/11 01</u>	71 <u>22 0 20 .</u>					
A	rea (sf)	CN D	CN Description					
	2.512	98 F	aved parki	ing & roofs				
	19,818	74 >	75% Grass	s cover, Go	ood, HSG C			
	81,569	70 V	Voods, Go	od, HSG C				
5	03,899	70 Weighted Average						
	01,387			vious Area				
	2,512	0	.50% Impe	ervious Area	a			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description			
10.7	50	0.0300	0.08		Sheet Flow,			
10.1	1,085	0.1290	1.80		Woods: Light underbrush n= 0.400 P2= 3.10" Shallow Concentrated Flow, Woodland Kv= 5.0 fps			
20.8	1,135	Total						

Summary for Subcatchment 25S: STREET DRAINAGE TO RETENTION BASIN

23.17 cfs @ 12.17 hrs, Volume= Runoff

2.036 af, Depth> 2.68"

	Ar	ea (sf)	CN [escription			
*		14,440		mpervious	in A soils		
*		2,086	98 li	mpervious	in B soils		
*	1	07,932	98 1	mpervious	in C soils		
		19,587	70 V	Voods, Go	od, HSG C		
		17,729	39 >	75% Grass	s cover, Go	ood, HSG A	
		14,430	61 >	-75% Gras	s cover, Go	ood, HSG B	
	2	20,338				ood, HSG C	
_	3	96,542	79 V	Veighted A	verage		
	2	272.084 68.		68.61% Pervious Area			
	1	24,458	3	31.39% Impervious Area			
					O	Description	
	Тс	Length	Slope	Velocity	Capacity	Description	
_	<u>(min)</u>	<u>(feet)</u>	<u>(ft/ft)</u>	(ft/sec)	(cfs)	OL (Flow	
	7.2	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"	
						Woods; Light underbrush 11-0.400 12 0.10	
	4.6	438	0.1000	1.58		Shallow Concentrated Flow,	
				4.00		Woodland Kv= 5.0 fps Shallow Concentrated Flow,	
	0.6	158	0.0440	4.26		Paved Kv= 20.3 fps	
_						Paveu NV- 20.0 Ips	
	12.4	646	Total				

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Summary for Subcatchment 26S: OVERLAND FLOW INTO RET BASIN

Runoff

0.02 cfs @ 12.46 hrs, Volume=

0.012 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 10 YEAR Rainfall=4.87"

Α	rea (sf)		escription						
	36,895		O1 11CO A						
	36,895	1	00.00% Pe	ervious Are	a				
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description				
3.0		0.1860	0.24		Sheet Flow,				
0.1	26	0.3300	8.62		Grass: Dense n= 0.240 P2= 3.10" Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps				
3.1	69	Total							

Summary for Subcatchment 27S: OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE

Runoff

0.65 cfs @ 12.08 hrs, Volume=

0.048 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 10 YEAR Rainfall=4.87"

		(=f)	CN D	escription		
_	A	rea (sf)			- Lla - Man	
*		2,085	98 Ir	npervious	- wet bottor	TI
		1,108	74 >	75% Gras	s cover, Go	ood, HSG C
		11,382	61 >	75% Grass	s cover, Go	ood, HSG B
_				/eighted A		
		14,575	67 V	F 000/ D-	verage	
		12,490			vious Area	
		2.085	1	4.31% lmp	ervious Ar	ea
		_,-				
	Ta	Length	Slope	Velocity	Capacity	Description
	Тс			(ft/sec)	(cfs)	·
_	(min)	(feet)	(ft/ft)_		(013)	Oh and Flow
	4.8	50	0.0800	0.17		Sheet Flow,
						Grass: Dense n= 0.240 P2= 3.10"
	0.4	24	0.0330	2.72		Shallow Concentrated Flow,
	0.1	24	0.0000	2.12		Grassed Waterway Kv= 15.0 fps
						Oldood
	4.9	74	Total			

Summary for Reach 20R: CULVERT UNDER DRIVE A

Inflow Area =

70.130 ac, 4.30% Impervious, Inflow Depth > 1.99" for 10 YEAR event 82.81 cfs @ 12.43 hrs, Volume= 11.623 af

Inflow Outflow

82.78 cfs @ 12.43 hrs, Volume=

11.622 af, Atten= 0%, Lag= 0.2 min

Type III 24-hr 10 YEAR Rainfall=4.87"

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Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Max. Velocity= 9.66 fps, Min. Travel Time= 0.1 min Avg. Velocity = 3.43 fps, Avg. Travel Time= 0.3 min

Peak Storage= 462 cf @ 12.43 hrs Average Depth at Peak Storage= 0.86' Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 302.29 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished Length= 54.0' Slope= 0.0093 '/' Inlet Invert= 429.00', Outlet Invert= 428.50'

Summary for Reach 21R: (new Reach)

88.403 ac, 7.03% Impervious, Inflow Depth > 1.75" for 10 YEAR event Inflow Area =

87.67 cfs @ 12.46 hrs, Volume= 12.924 af inflow =

12.924 af, Atten= 0%, Lag= 0.0 min 87.67 cfs @ 12.46 hrs, Volume= Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: FLOW PATH FROM RET BASIN TO MASS PIKE

9.950 ac, 28.71% Impervious, Inflow Depth = 0.82" for 10 YEAR event Inflow Area =

1.70 cfs @ 13.19 hrs, Volume= 0.683 af Inflow

0.683 af, Atten= 0%, Lag= 0.6 min 1.70 cfs @ 13.20 hrs, Volume= Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.13 fps, Min. Travel Time= 0.3 min Avg. Velocity = 2.28 fps, Avg. Travel Time= 0.4 min

Peak Storage= 33 cf @ 13.19 hrs Average Depth at Peak Storage= 0.19' Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 292.23 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 5.0 '/' Top Width= 22.00' Length= 60.0' Slope= 0.0750 '/' Inlet Invert= 420.50', Outlet Invert= 416.00'

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Summary for Reach 23R: FLOW PATH FROM CULVERT TO MASS PIKE

70.130 ac, 4.30% Impervious, Inflow Depth > 1.99" for 10 YEAR event Inflow Area =

11.622 af 82.78 cfs @ 12.43 hrs, Volume= Inflow

11.609 af, Atten= 0%, Lag= 2.1 min 82.44 cfs @ 12.47 hrs, Volume= Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.16 fps, Min. Travel Time= 1.1 min Avg. Velocity = 2.91 fps, Avg. Travel Time= 2.4 min

Peak Storage= 5,681 cf @ 12.45 hrs Average Depth at Peak Storage= 1.45' Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 179.73 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 5.0 '/' Top Width= 22.00' Length= 423.0' Slope= 0.0284 '/' Inlet Invert= 428.50', Outlet Invert= 416.50'



Summary for Reach 24R: FLOW PATH FROM WATER QUALITY SWALE TO CULVERT

19.504 ac, 8.17% Impervious, Inflow Depth > 2.19" for 10 YEAR event Inflow Area =

25.08 cfs @ 12.51 hrs, Volume= 3.563 af Inflow

3.544 af, Atten= 2%, Lag= 8.6 min 24.68 cfs @ 12.65 hrs, Volume= Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Max. Velocity= 4.67 fps, Min. Travel Time= 4.7 min

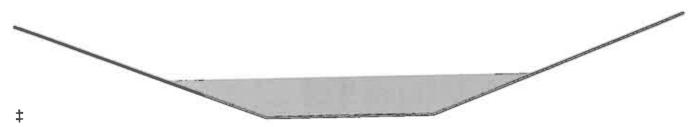
Avg. Velocity = 1.96 fps, Avg. Travel Time= 11.2 min

Peak Storage= 6,935 cf @ 12.57 hrs Average Depth at Peak Storage= 0.82' Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 152.36 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 3.0 '/' Top Width= 16.00' Length= 1,309.0' Slope= 0.0252 '/' Inlet Invert= 462.00', Outlet Invert= 429.00'

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Summary for Reach 25R: FLOW PATH FROM DET BASIN OUTLET TO CULVERT

2.159 ac, 38.93% Impervious, Inflow Depth = 1.59" for 10 YEAR event Inflow Area =

1.20 cfs @ 12.63 hrs, Volume= 0.286 af Inflow

0.286 af, Atten= 0%, Lag= 2.5 min 1.20 cfs @ 12.67 hrs, Volume= Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.17 fps, Min. Travel Time= 1.4 min Avg. Velocity = 0.63 fps, Avg. Travel Time= 2.5 min

Peak Storage= 98 cf @ 12.64 hrs Average Depth at Peak Storage= 0.14' Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 56.23 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 10.0 '/' Top Width= 26.00' Length= 95.0' Slope= 0.0132 '/' Inlet Invert= 430.25', Outlet Invert= 429.00'



Summary for Pond 19P: INFILTRATION BASIN AT 7+00 STIDSEN ROAD

9.950 ac, 28.71% Impervious, Inflow Depth > 2.47" for 10 YEAR event Inflow Area =

23.17 cfs @ 12.17 hrs, Volume= 2.048 af Inflow

1.642 af, Atten= 88%, Lag= 60.8 min 2.69 cfs @ 13.19 hrs, Volume= Outflow

0.960 af 0.99 cfs @ 13.19 hrs, Volume= Discarded = 0.683 af 1.70 cfs @ 13.19 hrs, Volume= Primary

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 427.36' @ 13.19 hrs Surf.Area= 17,740 sf Storage= 43,908 cf

Plug-Flow detention time= 231.0 min calculated for 1.639 af (80% of inflow) Center-of-Mass det. time= 154.8 min (986.1 - 831.3)

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Volume	Invert	Avail.Stor	age _	Storage	Description	
#1	423.00'		0 cf	Custom	ı Stage Data (Pri	ismatic) Listed below (Recalc)
Elevatio (fee 423.0 424.0 426.0 428.0 430.0	n Si t) 0 0 0 0 0 0 0	urf.Area (sq-ft) 0 3,900 15,500 18,800 22,400 25,500	(cubic	Store c-feet) 0 1,950 19,400 34,300 11,200 14,370	Cum.Store (cubic-feet) 0 1,950 21,350 55,650 96,850 111,220	
Device #1 #2 #3	Routing Discarded Primary Primary	423.00' 426.00' 429.00'	2.41 8.0" Inlet n= 0 18.0	Round / Outlet 0.013 Co / long x	xfiltration over \$ Culvert L= 53.0 Invert= 426.00' / prugated PE, sm 10.0' breadth B 0.20, 0.40, 0.60	Surface area D' Ke= 0.500 422.00' S= 0.0755 '/' Cc= 0.900 ooth interior, Flow Area= 0.35 sf road-Crested Rectangular Weir 0.80 1.00 1.20 1.40 1.60 70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.99 cfs @ 13.19 hrs HW=427.36' (Free Discharge) 1=Exfiltration (Exfiltration Controls 0.99 cfs)

Primary OutFlow Max=1.70 cfs @ 13.19 hrs HW=427.36' (Free Discharge)

-2=Culvert (Inlet Controls 1.70 cfs @ 4.87 fps)

-3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 21P: DET BASIN AT OLIVE CIRCLE

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 434.37' @ 12.63 hrs Surf.Area= 4,461 sf Storage= 8,757 cf

Plug-Flow detention time= 113.1 min calculated for 0.471 af (92% of inflow) Center-of-Mass det. time= 74.4 min (896.7 - 822.3)

Volume	Invert 431.00'	Avail.Storage 34,416 cf	Storage Description Custom Stage Data (Prismatic) Listed below (Recalc)
--------	-------------------	----------------------------	--

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Elevation	Surf.Area	Inc.Store	Cum.Store
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)
431.00	0	0	0
432.00	2,090	1,045	1,045
434.00	4,050	6,140	7,185
436.00	6,275	10,325	17,510
438.00	8,710	14,985	32,495
438.20	10,500	1,921	34,416

Device	Routing	Invert	Outlet Devices
	Primary		6.0" Vert. Orifice/Grate C= 0.600
	Discarded	431.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.25 cfs @ 12.63 hrs HW=434.37' (Free Discharge) 2=Exfiltration (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=1.20 cfs @ 12.63 hrs HW=434.37' (Free Discharge) 1=Orifice/Grate (Orifice Controls 1.20 cfs @ 6.13 fps)

Summary for Pond 22P: DET BASIN OFF END OF RANDOLPH CIRCLE

19.504 ac, 8.17% Impervious, Inflow Depth > 2.20" for 10 YEAR event 31.67 cfs @ 12.32 hrs, Volume= 3.574 af Inflow Area =

Inflow =

25.08 cfs @ 12.51 hrs, Volume= 25.08 cfs @ 12.51 hrs, Volume= 3.563 af, Atten= 21%, Lag= 11.2 min Outflow =

3.563 af Primary =

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 482.69 @ 12.51 hrs Surf Area= 9,475 sf Storage= 22,700 cf

Plug-Flow detention time= 18.8 min calculated for 3.563 af (100% of inflow) Center-of-Mass det. time= 17.0 min (868.7 - 851.7)

Volume	Inv	ert <u>Avail.St</u>		Description	
#1	479.0	00' 54,0	40 cf Custom	Stage Data (Pri	smatic) Listed below (Recalc)
Elevatio		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
479.0	00	0	0	0	
480.0	00	5,400	2,700	2,700	
482.0	00	8,400	13,800	16,500	
484.0		11,500	19,900	36,400	
485.4		13,700	17,640	54,040	
Device	Routing	Invert			
#1	Primary	479.00'	12.0" Vert. O	rifice/Grate C=	= 0.600
#2	Primary	483.00'	10.0' long x	12.0' breadth Br	oad-Crested Rectangular Weir
	-	404 001	Head (feet) Coef. (English	0.20 0.40 0.60	0.80 1.00 1.20 1.40 1.60 70 2.67 2.66 2.67 2.66 2.64
#3	Primary	481.00'	15.0 Vert. O	filice/Grate A 3.	00 0-0.000

Type III 24-hr 10 YEAR Rainfall=4.87"

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Primary OutFlow Max=25.05 cfs @ 12.51 hrs HW=482.69' (Free Discharge)
1=Orifice/Grate (Orifice Controls 6.75 cfs @ 8.60 fps)

---2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

-3=Orifice/Grate (Orifice Controls 18.30 cfs @ 4.97 fps)

25 YEAR STORM

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Summary for Subcatchment 1: PRE FLOW TO W'LY PIKE CULVERT

Runoff = 163.37 cfs @ 12.37 hrs, Volume=

19.402 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 25 YEAR Rainfall=6.16"

Ar	ea (sf)	CN E	escription		
	52,232	30 V	Voods, Go	od, HSG A	
1	30,414			od, HSG B	
3,4	64 <u>,785</u> _			od, HSG C	
3,8	47,431		Veighted A		
3,8	47,431	1	00.00% Pe	ervious Area	3
Tc	Length	Slope	Velocity (ft/sec)	Capacity (cfs)	Description
<u>(min)</u>	(feet)	(ft/ft)		(013)	Sheet Flow,
9.5	50	0.0400	0.09		Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.3	2,115	0.0310	5.58	111.63	Channel Flow, Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
25.8	3,242	Total			

Summary for Subcatchment 2S: PRE FLOW TO E'LY PIKE CULVERT

Runoff = 8.67 cfs @ 12.20 hrs, Volume=

0.801 af, Depth> 2.55"

	Area (sf)	CN [Description		
	39,886			od, HSG B od, HSG C	
	124,226_				
	164,112	66 V	Veighted A	verage	
	164,112	1	100.00% Pe	ervious Area	а
To		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
(min)				(0.0)	Sheet Flow,
7.2	50	0.0800	0.12		Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	Channel Flow, Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

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Summary for Subcatchment 11S: POST TO W'LY PIKE CULVERT

Runoff

10.97 cfs @ 12.21 hrs, Volume=

1.113 af, Depth> 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 25 YEAR Rainfall=6.16"

	_		ON 1							
	Ar	ea (sf)		<u>Description</u>						
*		1,260	98	mpervious A soils						
*		1,260	98 l	mpervious	B soils					
*		12,600	98	mpervious	C soils					
		08,430	30	Noods, Go	od, HSG A					
		5,012	55	Noods, Go	od, HSG B					
		70,431	70	Noods, Go	od, HSG C					
		57,257	39	>75% Gras	s cover, Go	ood, HSG A				
		6,593	61	>75% Gras	s cover, Go	ood, HSG B				
		99,683	74	>75% Gras	s cover, Go	ood, HSG C				
362,526 55 Weighted Average										
		47,406		95.83% Pervious Area						
		•		4.17% Impervious Area						
		15,120		4.17 /0 IIIIpc	,, viouo ,o.	~				
	T -	1 orfile	Clone	Velocity	Capacity	Description				
	Tc	Length	Slope		(cfs)					
_	(min)	(feet)	(ft/ft)		(010)	Sheet Flow,				
	9.5	50	0.0400	0.09		Woods: Light underbrush n= 0.400 P2= 3.10"				
						Shallow Concentrated Flow,				
	3.9	992	0.0800	4.24		Snallow Concentrated Flow,				
						Grassed Waterway Kv= 15.0 fps				
	13.4	1,042	Total							

Summary for Subcatchment 12S: POST TO E'LY PIKE CULVERT

Runoff = 8.49

8.49 cfs @ 12.20 hrs, Volume=

0.785 af, Depth> 2.55"

Area (sf)_	CN	Description
39,886 111,978 8,865	55 70 74	Woods, Good, HSG B Woods, Good, HSG C >75% Grass cover, Good, HSG C
160,729 160,729	66	Weighted Average 100.00% Pervious Area

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	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
_	7.2		0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
	5.9	527	0.0900	1.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.4	207	0.0250	7.96	190.95	Channel Flow, Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
-	13.5	784	Total			

Summary for Subcatchment 15S: POST TO ENTRANCE OF STIDSEN ROAD CULVERT

102.57 cfs @ 12.35 hrs, Volume= 11.784 af, Depth> 2.92" Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 25 YEAR Rainfall=6.16"

Aı	ea (sf)	CN D	escription		
	25,208	98 P	aved parki	ing & roofs	
	15,609	30 V	loods, Go	od, HSG A	
	57,023	55 V	loods, Go	od, HSG B	
1,8	26,893	70 V	√oods, Go	od, HSG C	1 1100 A
·	1,620	39 >	75% Grass	s cover, Go	od, HSG A
	7,767	61 >	75% Grass	s cover, Go	od, HSG B
1	77,1 <u>08</u>				od, HSG C
2,1	11,228		Veighted A		
2,0	86,020			vious Area	_
	25,208	1	.19% Impe	ervious Area	3
_		01	Valoaity	Capacity	Description
To					
Tc	Length	Slope	Velocity		
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	_				Sheet Flow
(min) 9.5	(feet) 50	(ft/ft) 0.0400	(ft/sec) 0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10" Shallow Concentrated Flow,
(min) 9.5 10.0	(feet) 50 1,077	(ft/ft) 0.0400 0.1300	(ft/sec) 0.09 1.80	(cfs)	Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10" Shallow Concentrated Flow, Woodland Kv= 5.0 fps Channel Flow,
(min) 9.5	(feet) 50	(ft/ft) 0.0400	(ft/sec) 0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10" Shallow Concentrated Flow, Woodland Kv= 5.0 fps Channel Flow,
(min) 9.5 10.0	(feet) 50 1,077	(ft/ft) 0.0400 0.1300	(ft/sec) 0.09 1.80	(cfs)	Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10" Shallow Concentrated Flow, Woodland Kv= 5.0 fps
(min) 9.5 10.0	(feet) 50 1,077	(ft/ft) 0.0400 0.1300	(ft/sec) 0.09 1.80	(cfs)	Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10" Shallow Concentrated Flow, Woodland Kv= 5.0 fps Channel Flow, Area= 20.0 sf Perim= 31.0' r= 0.65'

Summary for Subcatchment 16S: POST TO RANDOLPH CIRCLE DRAINAGE

21.24 cfs @ 12.34 hrs, Volume= Runoff

2.449 af, Depth> 3.70"

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	Are <u>a (sf)</u>		escription				
	66,896			ng & roofs			
	66,352	70 V	Voods, Go	od, HSG C			
	212,436	74 >	75% Grass	s cover, Go	ood, HSG C		
	345.684	78 V	Veighted A	verage			
	278,788			vious Area			
	66,896	1	9.35% lmp	ervious Ar	ea		
				- "	D. andellen		
Te	Length	Slope	Velocity	Capacity	Description		
(min) (feet)	(ft/ft)	(ft/sec)	(cfs)_			
10.		0.0300	0.08		Sheet Flow,		
10.		* *			Woods: Light underbrush n= 0.400 P2= 3.10"		
14.	1.313	0.0970	1.56		Shallow Concentrated Flow,		
17.	,0.0				Woodland Ky= 5 0 fps		

Summary for Subcatchment 20S: STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE

Woodland Kv= 5.0 fps

Runoff = 7.33 cfs @ 12.16 hrs, Volume=

1,363 Total

24.8

0.643 af, Depth> 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 25 YEAR Rainfall=6.16"

	A	rea (sf)	CN D	Description						
*		10,247	98 li	Impervious B soils						
*		24,274	98 li	npervious	C soils					
		6,013	70 V	Voods, Go	od, HSG C					
		6,329	61 >	75% Grass	s cover, Go	ood, HSG B				
		32,602	74 >	75% Grass	s cover, Go	ood, HSG C				
_		79,465	83 V	Veighted A	verage					
		44.944	5	6.56% Per	vious Area					
		34,521	4	3.44% Imp	ervious Ar	ea				
		,								
	Tc	Length	Slope	Velocity	Capacity	Description				
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)					
_	11.0	50	0.0100	0.08		Sheet Flow,				
	1110					Grass: Dense n= 0.240 P2= 3.10"				
	1.0	122	0.0100	2.03		Shallow Concentrated Flow,				
						Paved Kv= 20.3 fps				
-	12.0	172	Total							

Summary for Subcatchment 23S: OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE

Runoff = 26.12 cfs @ 12.30 hrs, Volume=

2.815 af, Depth> 2.92"

1,135 Total

20.8

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Area (sf)		Description			_		
2,512	98	Paved park	ing & roofs				
19,818	74	>75% Gras	s cover, Go	ood, HSG C			
481,569	70	Woods, Go	<u>od, HSG C</u>		_		
503,899	70	Weighted A	verage				
501,387		99.50% Per	vious Area				
2,512		0.50% lmpe	ervious Area	a			
Tc Lengt	n Slope	e Velocity	Capacity	Description			
(min) (feet			(cfs)		_		
10.7 5				Sheet Flow,			
10.7	, 0.000			Woods: Light underbrush n= 0.400 P2= 3.10"			
10.1 1,08	5 0.129	0 1.80		Shallow Concentrated Flow,			
				Woodland Kv= 5.0 fps	_		

Summary for Subcatchment 25S: STREET DRAINAGE TO RETENTION BASIN

2.894 af, Depth> 3.81" 32.87 cfs @ 12.17 hrs, Volume= Runoff

	Ar	ea (sf) _	CN D	escription							
*		14,440	98 lr	98 Impervious in A soils							
*		2,086	98 Ir	npervious i	n B soils						
*	10	07,932	98 lr	npervious i	in C soils						
		19,587	70 V	loods, God	od, HSG C	1.1100 Å					
		17,729	39 >	75% Grass	s cover, Go	ood, HSG A					
		14,430		75% Grass	s cover, Go	ood, HSG B					
	2	20,338				ood, HSG C					
	3	96,542	79 V	Veighted A	verage						
	2	72,084		68.61% Pervious Area							
	1	24,458	3	1.39% Impervious Area							
	-	1	Clone	Velocity	Capacity	Description					
	Tc	Length	Slope (ft/ft)	(ft/sec)	(cfs)						
_	(min)	(feet)	0.0800	0.12	(5.5)	Sheet Flow,					
	7.2	50	0.0000	0.12		Woods: Light underbrush n=.0.400 P2= 3.10"					
	4.6	438	0.1000	1.58		Shallow Concentrated Flow,					
	4.6	450	0.1000			Woodland Kv= 5.0 fps					
	0.6	158	0.0440	4.26		Shallow Concentrated Flow,					
	5.0	100				Paved Kv= 20.3 fps					
_	12.4	646	Total								

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Summary for Subcatchment 26S: OVERLAND FLOW INTO RET BASIN

Runoff

0.18 cfs @ 12.28 hrs, Volume=

0.035 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 25 YEAR Rainfall=6.16"

		. (-5)	ON D	occription					
Area (sf) CN Description									
_		36,895		39 >75% Grass cover, Good, HSG A					
36,895 100.00% Per					ervious Are	a			
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description			
-	3.0	43	0.1860	0.24		Sheet Flow,			
	0.1	26	0.3300	8.62		Grass: Dense n= 0.240 P2= 3.10" Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps			
-	3.1	69	Total						

Summary for Subcatchment 27S: OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE

Runoff

1.03 cfs @ 12.08 hrs, Volume=

0.074 af, Depth> 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 25 YEAR Rainfall=6.16"

	A	rea (sf)	CN D	escription		
*		2,085	98 Ir	npervious	- wet botto	m
		1,108	74 >	75% Grass	s cover, Go	ood, HSG C
		11,382	61 >	75% Grass	s cover, Go	ood, HSG B
		14,575	67 V	Veighted A	verage	
		12,490			vious Area	
		2,085	1	4.31% imp	ervious Ar	ea
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
_	4.8	50	0.0800	0.17		Sheet Flow,
	-т.О	-				Grass: Dense n= 0.240 P2= 3.10"
	0.1	24	0.0330	2.72		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
_						Glassed Waterway IV. 10.0 ipo
	4.9	74	Total			

Summary for Reach 20R: CULVERT UNDER DRIVE A

Inflow Area =

129.19 cfs @ 12.41 hrs, Volume=

70.130 ac, 4.30% Impervious, Inflow Depth > 2.99" for 25 YEAR event

Inflow Outflow

129.16 cfs @ 12.41 hrs, Volume=

17.463 af 17.461 af, Atten= 0%, Lag= 0.1 min

Type III 24-hr 25 YEAR Rainfall=6.16"

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Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Max. Velocity= 11.33 fps, Min. Travel Time= 0.1 min Avg. Velocity = 3.86 fps, Avg. Travel Time= 0.2 min

Peak Storage= 615 cf @ 12.41 hrs Average Depth at Peak Storage= 1.14' Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 302.29 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished Length= 54.0' Slope= 0.0093 '/' Inlet Invert= 429.00', Outlet Invert= 428.50'



Summary for Reach 21R: (new Reach)

88.403 ac, 7.03% Impervious, Inflow Depth > 2.70" for 25 YEAR event Inflow Area =

138.13 cfs @ 12.43 hrs, Volume= 19.908 af Inflow

19.908 af, Atten= 0%, Lag= 0.0 min 138.13 cfs @ 12.43 hrs, Volume= Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: FLOW PATH FROM RET BASIN TO MASS PIKE

9.950 ac, 28.71% Impervious, Inflow Depth > 1.63" for 25 YEAR event Inflow Area =

2.47 cfs @ 13.24 hrs, Volume= 1.350 af Inflow

1.350 af, Atten= 0%, Lag= 0.5 min 2.47 cfs @ 13.25 hrs, Volume= Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Max. Velocity= 3.49 fps, Min. Travel Time= 0.3 min

Avg. Velocity = 2.67 fps, Avg. Travel Time= 0.4 min

Peak Storage= 42 cf @ 13.24 hrs Average Depth at Peak Storage= 0.23' Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 292.23 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 5.0 '/' Top Width= 22.00' Length= 60.0' Slope= 0.0750 '/' Inlet Invert= 420.50', Outlet Invert= 416.00'

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Summary for Reach 23R: FLOW PATH FROM CULVERT TO MASS PIKE

70.130 ac, 4.30% Impervious, Inflow Depth > 2.99" for 25 YEAR event Inflow Area =

17.461 af 129.16 cfs @ 12.41 hrs, Volume= Inflow

17.446 af, Atten= 0%, Lag= 1.9 min 128.75 cfs @ 12.45 hrs, Volume= Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.89 fps, Min. Travel Time= 1.0 min Avg. Velocity = 3.15 fps, Avg. Travel Time= 2.2 min

Peak Storage= 7,927 cf @ 12.42 hrs Average Depth at Peak Storage= 1.75'

Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 179.73 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 5.0 '/' Top Width= 22.00'

Length= 423.0' Slope= 0.0284 '/'

inlet Invert= 428.50', Outlet Invert= 416.50'

#

Summary for Reach 24R: FLOW PATH FROM WATER QUALITY SWALE TO CULVERT

19.504 ac, 8.17% Impervious, Inflow Depth > 3.23" for 25 YEAR event Inflow Area =

5.249 af 41.00 cfs @ 12.45 hrs, Volume= Inflow

5.226 af, Atten= 3%, Lag= 7.5 min 39.57 cfs @ 12.58 hrs, Volume= Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.33 fps, Min. Travel Time= 4.1 min

Avg. Velocity = 2.14 fps, Avg. Travel Time= 10.2 min

Peak Storage= 9,783 cf @ 12.51 hrs Average Depth at Peak Storage= 1.05' Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 152.36 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 3.0 '/' Top Width= 16.00' Length= 1,309.0' Slope= 0.0252 '/' Inlet Invert= 462.00', Outlet Invert= 429.00'

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Summary for Reach 25R: FLOW PATH FROM DET BASIN OUTLET TO CULVERT

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth = 2.52" for 25 YEAR event

Inflow = 1.48 cfs @ 12.66 hrs, Volume= 0.453 af

Outflow = 1.48 cfs @ 12.70 hrs, Volume= 0.453 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.25 fps, Min. Travel Time= 1.3 min Avg. Velocity = 0.66 fps, Avg. Travel Time= 2.4 min

Peak Storage= 113 cf @ 12.67 hrs Average Depth at Peak Storage= 0.16'

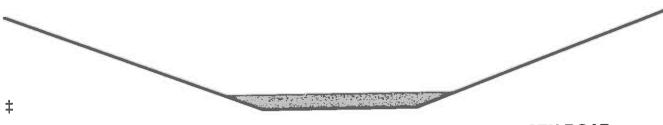
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 56.23 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 10.0 '/' Top Width= 26.00'

Length= 95.0' Slope= 0.0132 '/'

Inlet Invert= 430.25', Outlet Invert= 429.00'



Summary for Pond 19P: INFILTRATION BASIN AT 7+00 STIDSEN ROAD

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 3.53" for 25 YEAR event

Inflow = 33.03 cfs @ 12.17 hrs, Volume= 2.929 af

Outflow = 3.56 cfs @ 13.24 hrs, Volume= 2.421 af, Atten= 89%, Lag= 64.2 min

Discarded = 1.10 cfs @ 13.24 hrs, Volume= 1.071 af Primary = 2.47 cfs @ 13.24 hrs, Volume= 1.350 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 428.49' @ 13.24 hrs Surf.Area= 19,673 sf Storage= 64,984 cf

Plug-Flow detention time= 236.9 min calculated for 2.421 af (83% of inflow) Center-of-Mass det. time= 166.7 min (988.5 - 821.8)

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Volume	Invert	Avail.Sto	rage Storage	Description	
#1	423.00	111,22	20 cf Custom	Stage Data (Pri	ismatic) Listed below (Recalc)
Elevatio	t)	urf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
423.0		0	0 1,950	1,950	
424.0		3,900	19,400	21,350	
426.0	-	15,500	34,300	55,650	
428.0	-	18,800 22,400	41,200	96,850	
430.0		25,500	14,370	111,220	
430.6	0	25,500	14,570	111,220	
Device	Routing	Invert	Outlet Device		
#1	Discarded	423.00'		xfiltration over	
#2	Primary	426.00'	8.0" Round	Culvert L= 53.0)' Ke= 0.500
	•		Inlet / Outlet I	nvert= 426.00' /	422.00' S= 0.0755 '/' Cc= 0.900
#3	Primary	429.00'	18.0' long x	10.0' breadth Br 0.20 0.40 0.60	ooth interior, Flow Area= 0.35 sf coad-Crested Rectangular Weir 0.80 1.00 1.20 1.40 1.60 70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.10 cfs @ 13.24 hrs HW=428.49' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 1.10 cfs)

Primary OutFlow Max=2.47 cfs @ 13.24 hrs HW=428.49' (Free Discharge)

-2=Culvert (Inlet Controls 2.47 cfs @ 7.06 fps)

-3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 21P: DET BASIN AT OLIVE CIRCLE

Inflow Area =	2.159 ac, 38.93% Impervious, Inflow Depth > 3.99" for 25 YEAR event
Inflow =	8.05 cfs @ 12.16 hrs, Volume= 0.717 af
Outflow =	1.78 cfs @ 12.66 hrs, Volume= 0.669 af, Atten= 78%, Lag= 30.0 min
Discarded =	0.30 cfs @ 12.66 hrs, Volume= 0.216 af
Primary =	1.48 cfs @ 12.66 hrs, Volume= 0.453 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 435.19' @ 12.66 hrs Surf.Area= 5,376 sf Storage= 12,803 cf

Plug-Flow detention time= 112.1 min calculated for 0.667 af (93% of inflow) Center-of-Mass det. time= 76.9 min (889.9 - 813.0)

Volume	Invert		Storage Description
#1	431.00'	34,416 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

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Elevation	Surf.Area	Inc.Store	Cum.Store
(feet)	(sq-ft)	(cubic-feet)	<u>(cubic-feet)</u>
431.00	0	0	0
432.00	2,090	1,045	1,045
434.00	4,050	6,140	7,185
436.00	6,275	10,325	17,510
438.00	8,710	14,985	32,495
438.20	10,500	1,921	34,416

Device	Routing	Invert_	Outlet Devices	
#1	Primary	432.50'	6.0" Vert. Orifice/Grate	C= 0.600
#2	Discarded	431 00'	2.410 in/hr Exfiltration of	ver Surface area

Discarded OutFlow Max=0.30 cfs @ 12.66 hrs HW=435.19' (Free Discharge) 1—2=Exfiltration (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=1.48 cfs @ 12.66 hrs HW=435.19' (Free Discharge) 1=Orifice/Grate (Orifice Controls 1.48 cfs @ 7.52 fps)

Summary for Pond 22P: DET BASIN OFF END OF RANDOLPH CIRCLE

19.504 ac, 8.17% Impervious, Inflow Depth > 3.24" for 25 YEAR event Inflow Area =

47.12 cfs @ 12.31 hrs, Volume= 5.264 af Inflow =

41.00 cfs @ 12.45 hrs, Volume= 41.00 cfs @ 12.45 hrs, Volume= 5.249 af, Atten= 13%, Lag= 8.2 min Outflow =

5.249 af Primary =

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 483.49' @ 12.45 hrs Surf.Area= 10,714 sf Storage= 30,771 cf

Plug-Flow detention time= 18.4 min calculated for 5.238 af (100% of inflow)

Center-of-Mass det. time= 16.7 min (857.6 - 840.9)

Volume	lnv	ert <u>Avail.Sto</u>	rage Storage D	escription				
#1	479.0	54,04	40 cf Custom S	Stage Data (Pri	ismatic) Listed below (Recalc)			
Elevatio		Surf.Ārea (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)				
479.0	0	0	0	0				
480.0	00	5,400	2,700	2,700				
482.0	00	8,400	13,800	16,500				
484.0	00	11,500	19,900	36,400				
485.4	10	13,700	17,640	54,040				
Device	Routing	Invert_	Outlet Devices					
#1	Primary	479.00'	12.0" Vert. Orif					
#2	Primary	483.00'	10.0' long x 12	10.0' long x 12.0' breadth Broad-Crested Rectangular Weir				
#2	Drimon	481.00'	Head (feet) 0.2 Coef. (English) 15.0" Vert. Orif	2.57 2.62 2.	0.80 1.00 1.20 1.40 1.60 70 2.67 2.66 2.67 2.66 2.64 00 C= 0.600			
#3	Primary	401.00	10.0 AGIT OIL	iloci Oi ate A J.	•• • • • • • • • • • • • • • • • • • • •			

Type III 24-hr 25 YEAR Rainfall=6.16"

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Primary OutFlow Max=40.97 cfs @ 12.45 hrs HW=483.49' (Free Discharge)

1=Orifice/Grate (Orifice Controls 7.56 cfs @ 9.62 fps)

—2=Broad-Crested Rectangular Weir (Weir Controls 9.19 cfs @ 1.87 fps)

-3=Orifice/Grate (Orifice Controls 24.23 cfs @ 6.58 fps)

50 YEAR STORM

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Summary for Subcatchment 1: PRE FLOW TO W'LY PIKE CULVERT

Runoff = 223.94 cfs @ 12.37 hrs, Volume=

26.327 af, Depth> 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 50 YEAR Rainfall=7.36"

А	rea (sf)	CN E	escription		
	52,232			od, HSG A	
1	30,414			od, HSG B	
3,4	64,78 <u>5</u>	<u>70 V</u>	<u>Voods, Go</u>	od, HSG C	
3,8	47,431		Veighted A		
3,8	47,431	1	00.00% Pe	ervious Area	a
Tc	Length	Slope	Velocity (ft/sec)	Capacity (cfs)	Description
<u>(min)</u>	(feet)	(ft/ft)		(018)	Sheet Flow,
9.5	50	0.0400	0.09		Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.3	2,115	0.0310	5.58	111.63	
25.8	3,242	Total			

Summary for Subcatchment 2S: PRE FLOW TO E'LY PIKE CULVERT

Runoff = 11.96 cfs @ 12.19 hrs, Volume= 1.093 af, Depth> 3.48"

	Aı	rea (sf)	CN [<u>Description</u>		
		39,886	55 V	Voods, Go	od, HSG B	
		24,226		Voods, Go	od, HSG C	
_		64,112	66 V	Veighted A	verage	
		64,112		100.00% Pe	ervious Are	a
		- ,				
	Tc	Length	Slope		Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	<u>(cfs)</u>	
_	7.2	50	0.0800	0.12		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.10"
	5.9	527	0.0900	1.50		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.4	207	0.0250	7.96	190.95	Channel Flow,
						Area= 24.0 sf Perim= 18.6' r= 1.29'
						n= 0.035 Earth, dense weeds
_	40.5	704	Total			

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Summary for Subcatchment 11S: POST TO W'LY PIKE CULVERT

Runoff

16.92 cfs @ 12.20 hrs, Volume=

1.629 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 50 YEAR Rainfall=7.36"

	Aı	rea (sf)	CN [escription		
*		1,260	98 li	npervious	A soils	
rk		1,260		npervious		
*		12,600		npervious		
		08,430			od, HSG A	
		5,012	55 V	Voods, Go	od, HSG B	
		70,431			od, HSG C	
		57,257	39 >	75% Grass	s cover, Go	ood, HSG A
		6,593	61 >	75% Gras	s cover, Go	ood, HSG B
		99,683	74 >	75% Gras	s cover, Go	ood, HSG C
	3	62,526		Veighted A		
		47,406	ç	5.83% Per	vious Area	
	15,120		4	.17% impe	ervious Area	a
	Tc	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cf <u>s)</u>	
	9.5	50	0.0400	0.09		Sheet Flow,
	•					Woods: Light underbrush n= 0.400 P2= 3.10"
	3.9	992	0.0800	4.24		Shallow Concentrated Flow,
						Grassed Waterway Kv= 15.0 fps
	13.4	1,042	Total	<u> </u>		

Summary for Subcatchment 12S: POST TO E'LY PIKE CULVERT

Runoff =

11.72 cfs @ 12.19 hrs, Volume=

1.070 af, Depth> 3.48"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
111,978	70	
8,865_	74	>75% Grass cover, Good, HSG C
160,729 160,729	66	Weighted Average 100.00% Pervious Area

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	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	7.2	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
	5.9	527	0.0900	1.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.4	207	0.0250	7.96	190.95	Channel Flow, Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
-	13.5	784	Total			

Summary for Subcatchment 15S: POST TO ENTRANCE OF STIDSEN ROAD CULVERT

137.86 cfs @ 12.34 hrs, Volume= 15.754 af, Depth> 3.90" Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 50 YEAR Rainfall=7.36"

Area (sf) CN Description 25,208 98 Paved parking & roofs 15,609 30 Woods, Good, HSG A 57,023 55 Woods, Good, HSG B 1,826,893 70 Woods, Good, HSG C 1,620 39 >75% Grass cover, Good, HSG A 7,767 61 >75% Grass cover, Good, HSG B 177,108 74 >75% Grass cover, Good, HSG C
15,609 30 Woods, Good, HSG A 57,023 55 Woods, Good, HSG B 1,826,893 70 Woods, Good, HSG C 1,620 39 >75% Grass cover, Good, HSG A 7,767 61 >75% Grass cover, Good, HSG B
57,023 55 Woods, Good, HSG B 1,826,893 70 Woods, Good, HSG C 1,620 39 >75% Grass cover, Good, HSG A 7,767 61 >75% Grass cover, Good, HSG B
1,826,893 70 Woods, Good, HSG C 1,620 39 >75% Grass cover, Good, HSG A 7,767 61 >75% Grass cover, Good, HSG B
1,620 39 >75% Grass cover, Good, HSG A 7,767 61 >75% Grass cover, Good, HSG B
7,767 61 >75% Grass cover, Good, HSG B
- 111000
177.108 74 >75% Grass cover, Good, HSG C
2,111,228 70 Weighted Average
2,086,020 98.81% Pervious Area
25,208 1.19% Impervious Area
To Length Slope Velocity Capacity Description
(min) (rost) (res)
9.5 50 0.0400 0.09 Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
OL II. On a suffer to different
10.0 1,077 0.1300 1.80 Shallow Concentrated Flow, Woodland Kv= 5.0 fps
A DECEMBER OF THE PROPERTY OF
4.8 1,638 0.0320 5.67 113.41 Channel Flow, Area= 20.0 sf Perim= 31.0' r= 0.65'
n= 0.035 Earth, dense weeds
04.2 2.765 Total

24.3 2,765 Total

Summary for Subcatchment 16S: POST TO RANDOLPH CIRCLE DRAINAGE

27.31 cfs @ 12.34 hrs, Volume= Runoff

3.162 af, Depth> 4.78"

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Area (sf) CN Description							
Area (s							
66,89	98 98		rking & roofs				
66,35	52 70	Woods,	Good, HSG C	,			
212,43	36 74	>75% Gr	ass cover, G	ood, HSG C			
345,68	34 78	Weighte	Average				
278,78			Pervious Area	a			
66.89			mpervious Ai				
00,00	,0	10.00701	mpor mous a				
Tc Len	ath Sk	pe Veloci	ty Capacity	Description			
	·	t/ft) (ft/se					
				Chart Flow			
10.7	50 0.03	300 0. 0	18	Sheet Flow,			
				Woods: Light underbrush n= 0.400 P2= 3.10"			
14.1 1,3	313 0.09	970 1.5	6	Shallow Concentrated Flow,			
				Woodland Kv= 5.0 fps			

Summary for Subcatchment 20S: STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE

9.20 cfs @ 12.16 hrs, Volume= Runoff

1,363 Total

24.8

0.815 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 50 YEAR Rainfall=7.36"

	Α	rea (sf)	CN_I	Description						
*		10.247	98	mpervious	B soils					
*		24,274	98 I	mpervious	C soils					
		6,013			od, HSG C					
		6,329	61	75% Gras	75% Grass cover, Good, HSG B					
		32,602	74 :	75% Gras	s cover, Go	ood, HSG C				
_	79,465 83 Weighted Average									
		44,944		56.56% Per	vious Area					
		34,521		43.44% lmp	pervious Ar	ea				
	Tc	Length	Slope	Velocity	Capacity	Description				
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)_					
	11.0	50	0.0100	0.08		Sheet Flow,				
						Grass: Dense n= 0.240 P2= 3.10"				
	1.0	122	0.0100	2.03		Shallow Concentrated Flow,				
	,					Paved Kv= 20.3 fps				
_	12.0	172	Total							

Summary for Subcatchment 23S: OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE

35.10 cfs @ 12.29 hrs, Volume= Runoff

3.763 af, Depth> 3.90"

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HydroCAD® 10.00-24 s/n 00422 © 2018 HydroCAD Software Solutions LLC Page 5 Description CN Area (sf) Paved parking & roofs 2,512 98 >75% Grass cover, Good, HSG C 19,818 74 Woods, Good, HSG C 481,569 70 70 Weighted Average 503,899 99.50% Pervious Area 501,387 0.50% Impervious Area 2,512

	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	10.7	50	0.0300	0.08		Sheet Flow,
	10.1	1,085	0.1290	1.80		Woods: Light underbrush n= 0.400 P2= 3.10" Shallow Concentrated Flow, Woodland Ky= 5.0 fps
-		4 4 4 4 4				

20.8 1,135 Total

Summary for Subcatchment 25S: STREET DRAINAGE TO RETENTION BASIN

Runoff = 42.05 cfs @ 12.17 hrs, Volume=

3.721 af, Depth> 4.91"

	Α	rea (sf)	CN D	escription				
*		14,440	98 II	Impervious in A soils				
*		2,086	98 II	npervious	in B soils			
*	1	07,932	98 Ir	npervious	in C soils			
		19,587	70 V	Voods, Go	od, HSG C			
		17,729				ood, HSG A		
	14,430 61 >75% Grass cover, Go							
	2	20,338	74 >	75% Gras	s cover, Go	ood, HSG C		
	396,542 79 Weighted Average							
		72,084	6	68.61% Pervious Area				
	1	24,458	3	1.39% lmp	ervious Ar	ea		
	Tc	Length	Slope	Velocity	Capacity	Description		
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
	7.2	50	0.0800	0.12		Sheet Flow,		
						Woods: Light underbrush n= 0.400 P2= 3.10"		
	4.6	438	0.1000	1.58		Shallow Concentrated Flow,		
						Woodland Kv= 5.0 fps		
	0.6	158	0.0440	4.26		Shallow Concentrated Flow,		
						Paved Kv= 20.3 fps		
	12.4	646	Total					

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Summary for Subcatchment 26S: OVERLAND FLOW INTO RET BASIN

Runoff

0.53 cfs @ 12.10 hrs, Volume=

0.064 af, Depth> 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 50 YEAR Rainfall=7.36"

	Α	rea (sf)	CN D	escription		
36,895 39 >75% Grass cover, Good, HSG A						
36,895 100.00% Pervious Area					ervious Are	a
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	3.0	43	0.1860	0.24		Sheet Flow,
	0.1	26	0.3300	8.62		Grass: Dense n= 0.240 P2= 3.10" Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
-	3.1	69	Total			

Summary for Subcatchment 27S: OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE

Runoff

1.41 cfs @ 12.08 hrs, Volume=

0.100 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 50 YEAR Rainfall=7.36"

	٨	rea (sf)	CN E	escription						
*		2,085			- wet botto	m				
		1,108	74 >	`						
		11,382	6 <u>1 ></u>	Oracl HOC B						
_		14,575	67 Weighted Average 85.69% Pervious Area							
		12,490								
		2,085	1	4.31% lmp	ervious Ar	ea				
	Тс	Length	Slope	Velocity	Capacity	Description				
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)					
_	4.8	50	0.0800	0.17	_	Sheet Flow,				
						Grass: Dense n= 0.240 P2= 3.10"				
	0.1	24	0.0330	2.72		Shallow Concentrated Flow,				
_						Grassed Waterway Kv= 15.0 fps				
	4.9	74	Total							

Summary for Reach 20R: CULVERT UNDER DRIVE A

70.130 ac, 4.30% Impervious, Inflow Depth > 3.98" for 50 YEAR event Inflow Area =

181.02 cfs @ 12.41 hrs, Volume= 23.252 af Inflow =

23.250 af, Atten= 0%, Lag= 0.1 min 180.93 cfs @ 12.41 hrs, Volume= Outflow

Type III 24-hr 50 YEAR Rainfall=7.36"

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Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Max. Velocity= 12.74 fps, Min. Travel Time= 0.1 min Avg. Velocity = 4.18 fps, Avg. Travel Time= 0.2 min

Peak Storage= 767 cf @ 12.41 hrs Average Depth at Peak Storage= 1.42' Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 302.29 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished Length= 54.0' Slope= 0.0093 '/' Inlet Invert= 429.00', Outlet Invert= 428.50'



Summary for Reach 21R: (new Reach)

Inflow Area = 88.403 ac, 7.03% Impervious, Inflow Depth > 3.65" for 50 YEAR event

Inflow = 193.10 cfs @ 12.44 hrs, Volume= 26.914 af

Outflow = 193.10 cfs @ 12.44 hrs, Volume= 26.914 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: FLOW PATH FROM RET BASIN TO MASS PIKE

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 2.48" for 50 YEAR event

Inflow = 8.08 cfs @ 12.68 hrs, Volume= 2.054 af

Outflow = 8.07 cfs @ 12.69 hrs, Volume= 2.053 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Max. Velocity= 4.84 fps, Min. Travel Time= 0.2 min Avg. Velocity = 3.11 fps, Avg. Travel Time= 0.3 min

Peak Storage= 100 cf @ 12.68 hrs Average Depth at Peak Storage= 0.41' Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 292.23 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 5.0 '/' Top Width= 22.00' Length= 60.0' Slope= 0.0750 '/' Inlet Invert= 420.50', Outlet Invert= 416.00'

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Summary for Reach 23R: FLOW PATH FROM CULVERT TO MASS PIKE

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 3.98" for 50 YEAR event

Inflow = 180.93 cfs @ 12.41 hrs, Volume= 23.250 af

Outflow = 179.98 cfs @ 12.44 hrs, Volume= 23.232 af, Atten= 1%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 7.49 fps, Min. Travel Time= 0.9 min Avg. Velocity = 3.32 fps, Avg. Travel Time= 2.1 min

Peak Storage= 10,191 cf @ 12.43 hrs Average Depth at Peak Storage= 2.00'

Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 179.73 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 5.0 '/' Top Width= 22.00'

Length= 423.0' Slope= 0.0284 '/'

Inlet Invert= 428.50', Outlet Invert= 416.50'



Summary for Reach 24R: FLOW PATH FROM WATER QUALITY SWALE TO CULVERT

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 4.25" for 50 YEAR event

Inflow = 57.37 cfs @ 12.41 hrs, Volume= 6.906 af

Outflow = 55.72 cfs @ 12.52 hrs, Volume= 6.880 af, Atten= 3%, Lag= 7.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.85 fps, Min. Travel Time= 3.7 min Avg. Velocity = 2.29 fps, Avg. Travel Time= 9.5 min

Peak Storage= 12,525 cf @ 12.46 hrs
Average Depth at Peak Storage= 1.24'

Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 152.36 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 3.0 '/' Top Width= 16.00'

Length= 1,309.0' Slope= 0.0252 '/'

Inlet Invert= 462.00', Outlet Invert= 429.00'

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Summary for Reach 25R: FLOW PATH FROM DET BASIN OUTLET TO CULVERT

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth > 3.44" for 50 YEAR event

Inflow = 1.67 cfs @ 12.69 hrs, Volume= 0.618 af

Outflow = 1.67 cfs @ 12.72 hrs, Volume= 0.618 af, Atten= 0%, Lag= 2.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.30 fps, Min. Travel Time= 1.2 min Avg. Velocity = 0.74 fps, Avg. Travel Time= 2.1 min

Peak Storage= 122 cf @ 12.70 hrs Average Depth at Peak Storage= 0.17'

Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 56.23 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 10.0 '/' Top Width= 26.00'

Length= 95.0' Slope= 0.0132 '/'

Inlet Invert= 430.25', Outlet Invert= 429.00'



Summary for Pond 19P: INFILTRATION BASIN AT 7+00 STIDSEN ROAD

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 4.56" for 50 YEAR event

Inflow = 42.46 cfs @ 12.17 hrs, Volume= 3.785 af

Outflow = 9.25 cfs @ 12.68 hrs, Volume= 3.212 af, Atten= 78%, Lag= 30.5 min

Discarded = 1.17 cfs @ 12.68 hrs, Volume= 1.158 af Primary = 8.08 cfs @ 12.68 hrs, Volume= 2.054 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 429.24' @ 12.68 hrs Surf.Area= 21,027 sf Storage= 80,286 cf

Plug-Flow detention time= 229.0 min calculated for 3.212 af (85% of inflow) Center-of-Mass det. time= 165.0 min (979.9 - 814.9)

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Volume	Invert	Avail.Sto		Description			
#1	423.00	111,22	20 cf Custon	n Stage Data (Pri	smatic) Listed below (Recalc)		
Elevation	on S	urf.Area	Inc.Store	Cum.Store			
(fee	et)	(s <u>q-ft)</u>	(cubic-feet)	(cubic-feet)			
423.0	00	0	0	0			
424.0	00	3,900	1,950	1,950			
426.0	00	15,500	19,400	21,350			
428.0	00	18,800	34,300	55,650			
430.0	00	22,400	41,200	96,850			
430.6	30	25,500	14,370	111,220			
Device	Routing	<u>Invert</u>	Outlet Device				
#1	Discarded	423.00'		xfiltration over S			
#2	Primary	426.00'		Culvert L= 53.0			
	-		Inlet / Outlet	Invert= 426.00' / -	422.00' S= 0.0755 '/' Cc= 0.900		
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf				
#3	Primary	429.00'	18.0' long x	10.0' breadth Br	oad-Crested Rectangular Weir		
			Head (feet)	0.20 0.40 0.60	0.80 1.00 1.20 1.40 1.60		
			Coef. (Englis	h) 2.49 2.56 2.1	70 2.69 2.68 2.69 2.67 2.64		

Discarded OutFlow Max=1.17 cfs @ 12.68 hrs HW=429.24' (Free Discharge)
—1=Exfiltration (Exfiltration Controls 1.17 cfs)

Primary OutFlow Max=8.03 cfs @ 12.68 hrs HW=429.24' (Free Discharge)

2=Culvert (Inlet Controls 2.86 cfs @ 8.20 fps)

-3=Broad-Crested Rectangular Weir (Weir Controls 5.17 cfs @ 1.22 fps)

Summary for Pond 21P: DET BASIN AT OLIVE CIRCLE

Inflow Area =	2.159 ac, 38.93% Impervious, Inflow D	epth > 5.09" for 50 YEAR event
Inflow =	10.18 cfs @ 12.15 hrs, Volume=	0.915 af
Outflow =	2.01 cfs @ 12.69 hrs, Volume=	0.862 af, Atten= 80%, Lag= 31.9 min
Discarded =	0.34 cfs @ 12.69 hrs, Volume=	0.243 af
Primary =	1.67 cfs @ 12.69 hrs, Volume=	0.618 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 435.87' @ 12.69 hrs Surf.Area= 6,132 sf Storage= 16,714 cf

Plug-Flow detention time= 116.4 min calculated for 0.860 af (94% of inflow) Center-of-Mass det. time= 85.3 min (891.7 - 806.4)

Volume	Invert _		Storage Description
#1	431.00'	34,416 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.00	0	0	0
432.00	2,090	1,045	1,045
434.00	4,050	6,140	7,185
436.00	6,275	10,325	17,510
438.00	8,710	14,985	32,495
438.20	10,500	1,921	34,416

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	6.0" Vert. Orifice/Grate C= 0.600
#2	Discarded	431.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.34 cfs @ 12.69 hrs HW=435.87' (Free Discharge) —2=Exfiltration (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=1.67 cfs @ 12.69 hrs HW=435.87' (Free Discharge)
1=Orifice/Grate (Orifice Controls 1.67 cfs @ 8.51 fps)

Summary for Pond 22P: DET BASIN OFF END OF RANDOLPH CIRCLE

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 4.26" for 50 YEAR event

Inflow = 62.10 cfs @ 12.31 hrs, Volume= 6.925 af

Outflow = 57.37 cfs @ 12.41 hrs, Volume= 6.906 af, Atten= 8%, Lag= 5.8 min

Primary = 57.37 cfs @ 12.41 hrs, Volume= 6.906 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 483.90' @ 12.41 hrs Surf.Area= 11,343 sf Storage= 35,242 cf

Plug-Flow detention time= 17.7 min calculated for 6.906 af (100% of inflow)

Center-of-Mass det. time= 16.0 min (849.2 - 833.2)

Volume	lnv	ert Avail.Sto	rage Storage	Description	
#1	479.0	00' 54,0	40 cf Custom	Stage Data (Pr	ismatic) Listed below (Recalc)
_,		0.51	1 . 01	0 01	
Elevation	on	Surf.Area	Inc.Store	Cum.Store	
(fee	et)	(sg-ft)	(cubic-feet)	(cubic-feet)	
479.0	00	0	0	0	
480.0	00	5,400	2,700	2,700	
482.0	00	8,400	13,800	16,500	
484.0	00	11,500	19,900	36,400	
485.4		13,700	17,640	54,040	
Device	Routing	Invert	Outlet Device:	S	
#1	Primary	479.00'	12.0" Vert. Or	ifice/Grate C=	= 0.600
#2	Primary	483.00'	10.0' long x 1	2.0' breadth Br	oad-Crested Rectangular Weir
	-		Head (feet) 0	.20 0.40 0.60	0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.57 2.62 2.	70 2.67 2.66 2.67 2.66 2.64
#3	Primary	481.00'		ifice/Grate X 3.	

Type III 24-hr 50 YEAR Rainfall=7.36"

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Primary OutFlow Max=57.16 cfs @ 12.41 hrs HW=483.89' (Free Discharge)

-1=Orifice/Grate (Orifice Controls 7.93 cfs @ 10.09 fps)

—2=Broad-Crested Rectangular Weir (Weir Controls 22.53 cfs @ 2.52 fps)

3=Orifice/Grate (Orifice Controls 26.70 cfs @ 7.25 fps)

100 YEAR STORM

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Summary for Subcatchment 1: PRE FLOW TO W'LY PIKE CULVERT

Runoff = 299.30 cfs @ 12.36 hrs, Volume= 35.041 af, Depth> 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 100 YEAR Rainfall=8.79"

Α	rea (sf)	CN_E	Description		
2	52,232	30 V	Voods, Go	od, HSG A	
1	30,414			od, HSG B	
3,4	64,785	70 V	<u>Voods, Go</u>	<u>od, HSG C</u>	
3,8	47,431		Veighted A		
3,8	47,431	1	00.00% Pe	ervious Area	a
Tc	Length	Slope	Velocity	Capacity	Description
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	<u>(cfs)</u>	Chast Flour
9.5	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.3	2,115	0.0310	5.58	111.63	Channel Flow, Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
- 05.0	0.040	Tatal			

25.8 3,242 Total

Summary for Subcatchment 2S: PRE FLOW TO E'LY PIKE CULVERT

Runoff = 16.07 cfs @ 12.19 hrs, Volume= 1.460 af, Depth> 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 100 YEAR Rainfall=8.79"

	A	rea (sf)	CN I	Description		
_		39,886 24,226			od, HSG B od, HSG C	
164,112 66 Weighted Averag 164,112 100.00% Perviou				Veighted A	verage	
	Tc (min)	Length (feet)	Slope (ft/ft)		Capacity (cfs)	Description
-	7.2	50	0.0800			Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
	5.9	527	0.0900	1.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.4	207	0.0250	7.96	190.95	Channel Flow, Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
-	42 E	79.1	Total			

13.5 784 Total

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Summary for Subcatchment 11S: POST TO W'LY PIKE CULVERT

Runoff :

24.72 cfs @ 12.20 hrs, Volume=

2.307 af, Depth> 3.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 100 YEAR Rainfall=8.79"

			O11 F			
_	A	rea (sf)		<u>Description</u>		
*		1,260		mpervious		
*		1,260	98	mpervious	B soils	
*		12,600	98 1	mpervious	C soils	
	1	08,430	30 V	Voods, Go	od, HSG A	
	-	5,012	55 \	Voods, Go	od, HSG B	
		70,431			od, HSG C	
		57,257				ood, HSG A
		6,593				ood, HSG B
		99,683				ood, HSG C
_				Veighted A		
		62,526			vious Area	
	3	47,406				
		15,120		1.17% impe	ervious Are	a
	_		01	\	Compositive	Description
	Tc	Length	Slope		Capacity	Description
_	<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	9.5	50	0.0400	0.09		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.10"
	3.9	992	0.0800	4.24		Shallow Concentrated Flow,
	3.0					Grassed Waterway Kv= 15.0 fps
_	13.4	1,042	Total			
	10.7	1,0-12	1 0 1011			

Summary for Subcatchment 12S: POST TO E'LY PIKE CULVERT

Runoff

15.74 cfs @ 12.19 hrs, Volume=

1.430 af, Depth> 4.65"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
111,978	70	Woods, Good, HSG C
8,865	7 <u>4</u>	>75% Grass cover, Good, HSG C
160,729 160,729	66	Weighted Average 100.00% Pervious Area

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	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	7.2	50	0.0800	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.10"
	5.9	527	0.0900	1.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.4	207	0.0250	7.96	190.95	Channel Flow, Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
-	13.5	784	Total			

Summary for Subcatchment 15S: POST TO ENTRANCE OF STIDSEN ROAD CULVERT

Runoff = 181.31 cfs @ 12.34 hrs, Volume= 20.707 af, Depth> 5.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 100 YEAR Rainfall=8.79"

	Aı	rea (sf)	CN D	escription		
_		25,208	98 F	aved park	ing & roofs	
		15,609			od, HSG A	
		57,023	55 V	Voods, Go	od, HSG B	
		26,893			od, HSG C	
	-,-	1,620	39 >	75% Gras	s cover, Go	ood, HSG A
		7,767	61 >	75% Gras	s cover, Go	ood, HSG B
	1	77,108	74 >	75% Gras	s cover, Go	ood, HSG C
_	2.1	11,228		Veighted A		
		86,020			vious Area	
	•	25,208	1	.19% Impe	ervious Area	a
	Tc	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/s <u>ec)</u>	(cfs)	
_	9.5	50	0.0400	0.09		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.10"
	10.0	1,077	0.1300	1.80		Shallow Concentrated Flow,
		·				Woodland Kv= 5.0 fps
	4.8	1,638	0.0320	5.67	113.41	Channel Flow,
						Area= 20.0 sf Perim= 31.0' r= 0.65'
						n= 0.035 Earth, dense weeds
-	24.2	2 765	Total			

24.3 2,765 Total

Summary for Subcatchment 16S: POST TO RANDOLPH CIRCLE DRAINAGE

Runoff = 34.62 cfs @ 12.34 hrs, Volume= 4.034 af, Depth> 6.10"

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HVOTOGA	יטט.טד עשבו	-24 S/N U	U422 @ 20	TO FIYUIUUM	(D 301tware 301dtions EEO
11,01007					
Α	rea (sf)	CN E	escription (
	66,896	98 F	aved park	ing & roofs	}
	66,352			od, HSG C	
2	212,436	74 >	75% Gras	s cover, Go	ood, HSG C
3	345,684	78 V	Veighted A	verage	
2	78,788	-		vious Area	
	66,896	1	9.35% Imp	ervious Ar	rea
Тс	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<u> </u>
10.7	50	0.0300	0.08		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.10"
14.1	1,313	0.0970	1.56		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
24.8	1,363	Total			

Summary for Subcatchment 20S: STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE

Runoff = 11.42 cfs @ 12.16 hrs, Volume=

1.022 af, Depth> 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 100 YEAR Rainfall=8.79"

	Α	rea (sf)	CN	Description						
*		10,247	98	Impervious B soils						
*		24,274	98	Impervious	C soils					
		6,013		Woods, Go						
		6,329				ood, HSG B				
		32,602	74	>75% Gras	s cover, Go	ood, HSG C				
		79,465		Weighted A						
		44,944		56.56% Pei						
		34,521		43.44% lmp	pervious Ar	ea				
						The state of the s				
	Tc	Length	Slope		Capacity	Description				
_	<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)_	<u>(cfs)</u>					
	11.0	50	0.0100	0.08		Sheet Flow,				
						Grass: Dense n= 0.240 P2= 3.10"				
	1.0	122	0.0100	2.03		Shallow Concentrated Flow,				
						Paved Kv= 20.3 fps				
_	12.0	172	Total							

Summary for Subcatchment 23S: OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE

Runoff = 46.17 cfs @ 12.29 hrs, Volume=

4.946 af, Depth> 5.13"

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.,					
 Aı	rea (sf)	CN [Description		
	2,512	98 F	Paved park	ing & roofs	
	19,818	74 >	75% Gras	s cover, Go	ood, HSG C
4	81,569	70 <u>\</u>	Voods, Go	<u>od, HSG C</u>	
5	03,899	70 V	Veighted A	verage	
	01,387	-		vious Area	
	2,512	C).50% Impe	ervious Are	a
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		Sheet Flow,
10.1	1,085	0.1290	1.80		Woods: Light underbrush n= 0.400 P2= 3.10" Shallow Concentrated Flow, Woodland Kv= 5.0 fps
20.8	1,135	Total			

Summary for Subcatchment 25S: STREET DRAINAGE TO RETENTION BASIN

Runoff = 53.04 cfs @ 12.17 hrs, Volume=

4.730 af, Depth> 6.24"

	Α	rea (sf)	CN E	escription						
*		14,440	98 li	Impervious in A soils						
*		2,086	98 li	npervious	in B soils					
rkr	1	07,932	98 li	npervious	in C soils					
		19,587			od, HSG C					
		17,729				ood, HSG A				
		14,430	61 >	75% Gras	s cover, Go	ood, HSG B				
	2	20,338	74_>	75% Gras	s cover, Go	ood, HSG C				
	3	96,542	79 V	Veighted A	verage					
	2	72,084	6	8.61% Per	vious Area					
	1	24,458	3	1.39% lmp	ervious Ar	ea				
	Tc	Length	Slope	Velocity	Capacity	Description				
	(min)_	(feet)	(ft/ft)	<u>(ft/sec)</u>	(cfs)_					
	7.2	50	0.0800	0.12		Sheet Flow,				
						Woods: Light underbrush n= 0.400 P2= 3.10"				
	4.6	438	0.1000	1.58		Shallow Concentrated Flow,				
						Woodland Kv= 5.0 fps				
	0.6	158	0.0440	4.26		Shallow Concentrated Flow,				
						Paved Kv= 20.3 fps				
	12.4	646	Total							

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Summary for Subcatchment 26S: OVERLAND FLOW INTO RET BASIN

[49] Hint: Tc<2dt may require smaller dt

Runoff

1.20 cfs @ 12.07 hrs, Volume=

0.106 af, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type III 24-hr 100 YEAR Rainfall=8.79"

	Α	rea (sf)	CN E	Description				
_	36,895			>75% Grass cover, Good, HSG A				
_	36,895 100.00% Pervious Area			00.00% Pe	ervious Are	a		
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description		
-	3.0	43	0.1860	0.24		Sheet Flow,		
	0.1	26	0.3300	8.62		Grass: Dense n= 0.240 P2= 3.10" Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps		
_	3.1	69	Total					

Summary for Subcatchment 27S: OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE

[49] Hint: Tc<2dt may require smaller dt

Runoff

1.88 cfs @ 12.08 hrs, Volume=

0.133 af, Depth> 4.78"

	A	rea (sf)	CN_[Description					
*		2,085	98 I	98 Impervious - wet bottom					
		1,108		· · · · · · · · · · · · · · · · · · ·					
		11,382	61 _>						
		14,575	67 V	67 Weighted Average					
		12,490	8	35.69% Per	vious Area	l .			
		2,085	14.31% Impervious Area			ea			
	Тс	Length	Slope		Capacity	Description			
	(min)	(feet)	<u>(ft/ft)</u>	(ft/sec)	(cfs)				
	4.8	50	0.0800	0.17		Sheet Flow,			
						Grass: Dense n= 0.240 P2= 3.10"			
	0.1	24	0.0330	2.72		Shallow Concentrated Flow,			
						Grassed Waterway Kv= 15.0 fps			
_	4.9	74	Total		•				

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Summary for Reach 20R: CULVERT UNDER DRIVE A

[62] Hint: Exceeded Reach 24R OUTLET depth by 0.41' @ 12.20 hrs [63] Warning: Exceeded Reach 25R INLET depth by 0.31' @ 12.40 hrs

Inflow Area = 70.130 ac, 4.30% impervious, Inflow Depth > 5.21" for 100 YEAR event

Inflow = 244.27 cfs @ 12.39 hrs, Volume= 30.453 af

Outflow = 244.17 cfs @ 12.40 hrs, Volume= 30.450 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 14.10 fps, Min. Travel Time= 0.1 min Avg. Velocity = 4.52 fps, Avg. Travel Time= 0.2 min

Peak Storage= 936 cf @ 12.40 hrs Average Depth at Peak Storage= 1.73' Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 302.29 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished Length= 54.0' Slope= 0.0093 '/'

Inlet Invert= 429.00', Outlet Invert= 428.50'

Summary for Reach 21R: (new Reach)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 88.403 ac, 7.03% Impervious, Inflow Depth > 4.85" for 100 YEAR event

Inflow = 282.20 cfs @ 12.42 hrs, Volume= 35.721 af

Outflow = 282.20 cfs @ 12.42 hrs, Volume= 35.721 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: FLOW PATH FROM RET BASIN TO MASS PIKE

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 3.60" for 100 YEAR event

Inflow = 24.43 cfs @ 12.45 hrs, Volume= 2.985 af

Outflow = 24.56 cfs @ 12.45 hrs, Volume= 2.985 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.50 fps, Min. Travel Time= 0.2 min Avg. Velocity = 3.35 fps, Avg. Travel Time= 0.3 min

Type III 24-hr 100 YEAR Rainfall=8.79"

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Peak Storage= 227 cf @ 12.45 hrs Average Depth at Peak Storage= 0.69'

Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 292.23 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds Side Slope Z-value= 5.0 '/' Top Width= 22.00'

Length= 60.0' Slope= 0.0750 '/'

Inlet Invert= 420.50'. Outlet Invert= 416.00'



Summary for Reach 23R: FLOW PATH FROM CULVERT TO MASS PIKE

[91] Warning: Storage range exceeded by 0.29'

[55] Hint: Peak inflow is 136% of Manning's capacity

[63] Warning: Exceeded Reach 20R INLET depth by 0.13' @ 12.80 hrs

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 5.21" for 100 YEAR event

inflow = 244.17 cfs @ 12.40 hrs, Volume= 30.450 af

Outflow = 242.87 cfs @ 12.42 hrs, Volume= 30.428 af, Atten= 1%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 8.01 fps, Min. Travel Time= 0.9 min Avg. Velocity = 3.51 fps, Avg. Travel Time= 2.0 min

Peak Storage= 12,877 cf @ 12.41 hrs Average Depth at Peak Storage= 2.29'

Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 179.73 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 5.0 '/' Top Width= 22.00'

Length= 423.0' Slope= 0.0284 '/'

Inlet Invert= 428.50', Outlet Invert= 416.50'



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Summary for Reach 24R: FLOW PATH FROM WATER QUALITY SWALE TO CULVERT

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 5.51" for 100 YEAR event

Inflow = 76.02 cfs @ 12.38 hrs, Volume= 8.955 af

Outflow = 74.27 cfs @ 12.49 hrs, Volume= 8.925 af, Atten= 2%, Lag= 6.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.31 fps, Min. Travel Time= 3.5 min Avg. Velocity = 2.43 fps, Avg. Travel Time= 9.0 min

Peak Storage= 15,444 cf @ 12.43 hrs
Average Depth at Peak Storage= 1.43'

Peak Full Depth= 2.00' Flow Area= 20.0 sf. Capacity=

Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 152.36 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 3.0 '/' Top Width= 16.00'

Length= 1,309.0' Slope= 0.0252 '/'

#

Inlet Invert= 462.00', Outlet Invert= 429.00'

Summary for Reach 25R: FLOW PATH FROM DET BASIN OUTLET TO CULVERT

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth > 4.57" for 100 YEAR event

Inflow = 1.86 cfs @ 12.72 hrs, Volume= 0.821 af

Outflow = 1.86 cfs @ 12.76 hrs, Volume= 0.821 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.34 fps, Min. Travel Time= 1.2 min Avg. Velocity = 0.84 fps, Avg. Travel Time= 1.9 min

Peak Storage= 131 cf @ 12.74 hrs Average Depth at Peak Storage= 0.18'

Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 56.23 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 10.0 '/' Top Width= 26.00'

Length= 95.0' Slope= 0.0132 '/'

Inlet Invert= 430.25', Outlet Invert= 429.00'



Volume

Invert

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Summary for Pond 19P: INFILTRATION BASIN AT 7+00 STIDSEN ROAD

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 5.83" for 100 YEAR event

Inflow = 53.83 cfs @ 12.17 hrs, Volume= 4.837 af

Outflow = 25.63 cfs @ 12.45 hrs, Volume= 4.211 af, Atten= 52%, Lag= 16.8 min

Discarded = 1.21 cfs @ 12.45 hrs, Volume= 1.225 af

Primary = 24.43 cfs @ 12.45 hrs, Volume= 2.985 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 429.58' @ 12.45 hrs Surf.Area= 21,645 sf Storage= 87,612 cf

Plug-Flow detention time= 195.8 min calculated for 4.211 af (87% of inflow) Center-of-Mass det. time= 138.1 min (946.5 - 808.4)

Avail Storage Storage Description

VOIUITIE	IIIVGIL AVO	iii.otorage otorag	C DOGGITPRIOTI	
#1	423.00'	111,220 cf Custo	m Stage Data (Pris	matic) Listed below (Recalc)
Elevation	Surf.Area	Inc.Store	Cum.Store	
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	
423.00	0	0	0	
424.00	3,900	1,950	1,950	
426.00	15,500	19,400	21,350	
428.00	18,800	34,300	55,650	
430.00	22,400	41,200	96,850	
430.60	25,500	14,370	111,220	
400.00	20,000	,00	,	

Device	Routing	<u> </u>	Outlet Devices
#1	Discarded		2.410 in/hr Exfiltration over Surface area
#2	Primary	426.00'	8.0" Round Culvert L= 53.0' Ke= 0.500
	•		Inlet / Outlet Invert= 426.00' / 422.00' S= 0.0755 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#3	Primary	429.00'	18.0' long x 10.0' breadth Broad-Crested Rectangular Weir
,, •			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.21 cfs @ 12.45 hrs HW=429.58' (Free Discharge)
1=Exfiltration (Exfiltration Controls 1.21 cfs)

Primary OutFlow Max=24.39 cfs @ 12.45 hrs HW=429.58' (Free Discharge)

2=Culvert (Inlet Controls 3.03 cfs @ 8.68 fps)

—3=Broad-Crested Rectangular Weir (Weir Controls 21.36 cfs @ 2.05 fps)

Summary for Pond 21P: DET BASIN AT OLIVE CIRCLE

Inflow Area =	2.159 ac, 38.93% Impervious, Inflow I	Depth > 6.42" for 100 YEAR event
Inflow =	12.73 cfs @ 12.15 hrs, Volume=	1.155 af
Outflow =	2.25 cfs @ 12.72 hrs, Volume=	1.099 af, Atten= 82%, Lag= 34.3 min
Discarded =	0.39 cfs @ 12.72 hrs, Volume=	0.278 af
Primary =	1.86 cfs @ 12.72 hrs, Volume=	0.821 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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Peak Elev= 436.60' @ 12.72 hrs Surf.Area= 7,007 sf Storage= 21,505 cf

Plug-Flow detention time= 123.9 min calculated for 1.097 af (95% of inflow) Center-of-Mass det. time= 96.9 min (897.0 - 800.1)

Volume	Inver	: Avail.Stg	rage Storage	Description	
#1	431.00	34,4	16 cf Custon	Stage Data (Pri	ismatic) Listed below (Recalc)
Elevation		urf.Area	Inc.Store	Cum.Store	
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)	
431.0	00	0	0	0	
432.0	00	2,090	1,045	1,045	
434.0	00	4,050	6,140	7,185	
436.0	00	6,275	10,325	17,510	
438.0	00	8,710	14,985	32,495	
438.2	20	10,500	1,921	34,416	
Davidae	Davidson	lan camb	Outlet Device		
Device	Routing	Invert	Outlet Device		
#1	Primary	432.50'	6.0" Vert. Ori	fice/Grate C=	0.600
#2	Discarded	431.00'	2.410 in/hr Ex	xfiltration over S	Surface area

Discarded OutFlow Max=0.39 cfs @ 12.72 hrs HW=436.60' (Free Discharge) **2=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=1.86 cfs @ 12.72 hrs HW=436.60' (Free Discharge) 1=Orifice/Grate (Orifice Controls 1.86 cfs @ 9.45 fps)

Summary for Pond 22P: DET BASIN OFF END OF RANDOLPH CIRCLE

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 5.52" for 100 YEAR event

Inflow = 80.37 cfs @ 12.31 hrs, Volume= 8.980 af

Outflow = 76.02 cfs @ 12.38 hrs, Volume= 8.955 af, Atten= 5%, Lag= 4.6 min

Primary = 76.02 cfs @ 12.38 hrs, Volume= 8.955 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 484.29' @ 12.38 hrs Surf.Area= 11,948 sf Storage= 39,742 cf

Plug-Flow detention time= 16.9 min calculated for 8.955 af (100% of inflow)

Center-of-Mass det. time= 15.2 min (841.2 - 826.0)

Volume	Invert	Avail.Storage	Storage Description
#1	479.00'	54,040 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
479.00	0	0	0
480.00	5,400	2,700	2,700
482.00	8,400	13,800	16,500
484.00	11,500	19,900	36,400
485.40	13,700	17,640	54,040

Type III 24-hr 100 YEAR Rainfall=8.79"

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Device	Routing	Invert_	Outlet Devices
#1	Primary	479.00'	12.0" Vert. Orifice/Grate C= 0.600
#2	Primary	483.00'	10.0' long x 12.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	481.00'	15.0" Vert. Orifice/Grate X 3.00 C= 0.600

Primary OutFlow Max=75.64 cfs @ 12.38 hrs HW=484.28' (Free Discharge)

-1=Orifice/Grate (Orifice Controls 8.27 cfs @ 10.52 fps)

—2=Broad-Crested Rectangular Weir (Weir Controls 38.50 cfs @ 3.01 fps)

3=Orifice/Grate (Orifice Controls 28.87 cfs @ 7.84 fps)